1485 h. 20.

THE MARINERS NEW KALENDAR.

Stampt according to a late Act of Parliament, with Three Two-penny Stampts.

BOOKS *of Navigation printed for* Thomas Page *and* William Mount

THE Coaſting Pilot for *England, Scotland, Holland,* &c.
The E. Pilot for the Channel E. Pilot for the *Streights*
The Eng. Pilot for the Northern Navigation.
The Eng. Pilot for the *W. Indies* Eng. Pilot for the *E Indies.*
Sea-Atlaſs, contain. Charts of the Sea Coaſt of the whole World
Great-Britain's Coaſting Pilot, By Capt. *Greenvile Collins*
The Mariners New Kalendar. By *Nathaniel Colſon.*
The Mariners Magazine. By Capt. *Samuel Sturmy*, Folio
Norwood's Syſtem of Navigation.
The Seamans Kalendar. By *Henry Philips.*
The Seamans New Kalendar. By *William Leybourn.*
The Seaman's Practice. By *Richard Norwood.*
Practical Navigation: or, an Introduction to the whole Art
The whole Art of Navigation. By Capt. *Daniel Newhouſe.*
Sherwin's Tables of Logarithms with a large New Errata.
Kerſey's Algebra.
A *Syſtem* of the *Mathematics*, in 2 Vol. 4*to*, By *J Hodgſon.*
The *Compleat Modeliſt, or Art of Rigging*; ſhewing how to raiſe the Model of any Ship; and to find the Length and Bigneſs of every Rope, with the Weight of their Anchors and Cables.
Navigation New Modell'd. By *Henry Wilſon.*
The Boatſwain's Art; ſhewing the Art of Rigging any Ship &c
The Compleat Shipwright. By *Edmand Buſhnel*, Shipwright.
The Ship-Builders Aſſiſtance. By *William Southerland.*
Compleat Shipwright and Mariner.
Sea-Gunners Companion. By Capt. *Povey.*
An Epitome of the whole Art of Navigation, containing an eaſy methodical way to become a compleat Navigator. By *J. Atkinſon.*
Epitome of Navigation the Three kinds of Sailing; *Aſtronomy* and *Geography* with uſeful Tables in Navigaion. By *H. Gellibrand.*
Norwood's Epitome of Navigation, with Additions, By *J. A.*
Mariner's Compaſs Rectified By *Audrew Wakely*, much enlarged. By *James Atkinſon.*
Coggeſhell's Sliding Rule, By *J. Good.*
Seaman's Companion, or Vade Mecum.
Bamford's Practical Gauger.
The Art of Shadows, By *J. Good*
An Epitome of Navigation. By *William Jones*
Arithmetical Trigonometry. By *Mark Forſter.*

N. B. *There are alſo ſold all ſorts of Mathematical and Sea Books, Pilots and Sea Charts for all Parts of the World,* Plain *and* Mercator; *or Books of any Subjects; Paper, or Paper-Books, the beſt Ink, and all other Stationary Ware.*

4 FEB

THE
MARINERS
NEW KALENDAR,

Containing

The Principles of Arithmetick and Geometry; with the Extraction of the Square and Cube Roots. Alſo Rules for finding the Prime, Epact, Moon's Age, Time of High-Water, with Tables for the ſame.

Together with

Exact Tables of the Sun's Place, Declination, and Right Aſcenſion. Of the Right Aſcenſion and Declination of the Principal Fixed Stars. Of the Latitude and Longitude of Places. A large Table of Difference of Latitude and Departure, for the exact Working a Traverſe.

ALSO,

The Deſcription and Uſe of the Sea-Quadrant, Fore-Staff, and Nocturnal. The Problems of Plain-Sailing and Aſtronomy, wrought by the Logarithms, and by *Gunter's* Scale. A Tide Table. The Courſes and Diſtances on the Coaſt of *Great Britain, Ireland, France,* &c. And the Soundings coming into the Channel. With Directions for ſailing into ſome Principal Harbours.

BY

NATHANIEL COLSON, *Student in the Mathematicks*

London: Printed for *Thomas Page*, and *William Mount* at the *Poſtern* on *Tower-Hill*. 1732.

Where you may have all Sorts of Mathematical and Sea Books.

To the Ingenious *Mariner*.

I *Here preſent thee with a* New Kalendar, *wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing too much practiſed) but to make* Things *plain and practicable. Here is nothing obſcure or difficult, to diſcourage young Beginners (for whom 'tis intended) but all Things treated of with as much Plainneſs (both of Matter and Method) as poſſible; and I aſſure thee were I preſent to inſtruct thee, I could by no means render things more intelligible than I have here done. I have endeavoured to omit nothing that might be materially uſeful, having reſpect to the deſign'd bigneſs of the Volume. The* Contents *are as follow:*

The Principles of Arithmetick, *with which I begin, becauſe I am ſenſible of the Loſs ſome have been at, that have attempted* Navigation *before they have underſtood ſomething of it; the* Extraction of the Square and Cube Roots*: In all which I have endeavoured to apply the Examlpes to Sea Affairs. Some neceſſary* Geometrical Problems, *uſeful in* Navigation. *Directions for finding the* Prime, Epact, Moon's Age, *and the* Time of Full Sea *(both according to the Ordinary and a more accurate Way) with* Tables *for the ſame.*

Tables of the Sun's Place and Declination, with Directions and Examples to every Caſe, how to uſe the Declination to find the Latitude: As alſo the neceſſary Tables for correcting the Declination, when the Difference of Longitude is conſiderable from the Meridian of London, *for which the ſaid Tables of Declination are calculated. A Table of the Sun's Right Aſcenſion. A Table of the Right Aſcenſion and Declination of ſome of the principal Fixed Stars, with the uſe of the ſaid Tables in finding the Time of a Star's coming to the Meridian; as alſo Directions at large for Obſervation of any of the ſaid Stars to find the Latitude of the Place, with Examples in each Caſe. The Deſcription of the* Sea-Quadrant, Fore-ſtaff *or* Nocturnal. *A Table of Latitude and Longitude of the principal Places on the Sea-Coaſt collected from the beſt Information. Problems of* Plain Sailing *and* Aſtronomy, *which (that the* Practitioners *might learn two things at once) are wrought both by the* Logarithms, *and* Gunter's *Scale. A large and very uſeful Table of Difference of* Latitude *and* Departure *to every Degree and Quarter Point of the Compaſs: With its uſe in working a Traverſe in order to keep a Reckoning at Sea. A* Rutter *for the Coaſt of* Great Britain, France, Ireland, Spain, Portugal, *&c. Shewing the Bearing and Diſtance from one Place to another. A Table of the* Soundings, *coming, into the* Channel, *giving the Depth of Water, and Quality of the Ground.* Laſtly *Directions for ſailing into ſome principal Harbours. By all, or any of which, if thou art any ways profited (as I know thou mayeſt, if thou wanteſt Information in any of theſe Things, and doſt but a little carefully animadvert upon what thou readeſt) I have my end: And thy kind Acceptance hereof will further Oblige me,*

Who am thy Friend

Nathaniel Colſon

4 FEB 67

The Principles of Arithmetick briefly and plainly Demonſtrated, with the Extraction of the Square and Cube Roots.

BECAUSE of the Uſefulneſs and Neceſſity of ſome Knowledge of *Arithmetick*, in the Art of *Navigation*, it is requiſite to begin with that, without which no orderly Procedure can be made, and firſt of

Numeration.

Numeration is that part of *Arithmetick*, whereby one may rightly expreſs the Value of any Number propoſed.

All *Numbers* are expreſſed by theſe Characters following.

1,	2,	3,	4,	5,	6,	7,	8,	9,	0.
One,	*Two,*	*Three,*	*Four,*	*Five,*	*Six,*	*Seven,*	*Eight,*	*Nine,*	*Cypher.*

Altho' Cyphers ſignify nothing by themſelves, yet being put before (or to the Right Hand of) other Figures, they increaſe their Value as much as if they were all Figures, as may plainly be ſeen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thouſands	1000
12345	X Thouſands	10000
123456	C Thouſands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to their Places they are ſet in; as 1 in the firſt Place, or Place of *Units*, is *One*; in the ſecond Place *Ten*; in the third Place *One Hundred*; in the fourth Place *One Thouſand*; in the fifth Place *Ten Thouſand*, &c.

The Table directs how properly to expreſs any given *Number*: As 123 which *Number* conſiſting of three Places, is thus numbered, *One Hundred Twenty Three*; this *Number* 123456, conſiſting of ſix Places, is thus expreſſed, *One Hundred, Twenty Three Thouſand, Four Hundred Fifty Six*; and this *Number* 123456789, conſiſting of nine Places, is thus numbered, *One Hundred Twenty Three Millions, Four Hundred Fifty Six Thouſand, Seven Hundred Eighty Nine.*

Ad.

ADdition is that which of ſeveral Sums makes but one Sum.

Example. Suppoſe four Men (A. B. C. D.) owe me ſeveral Sums of Money, I would know how much is due to me in the whole: I begin at the firſt row towards the Right Hand and ſay, 3 and 6 is 9 and 2 is 11, and 4 is 15: ſetting down the 5 under the row added up; then I carry the 1 ten to the next row, ſaying 1 and 4 is 5, and 5 is 10 and 3 is 13, and 6 is 19; ſet down 9 under the row added up, and carry 1 to the next row, ſaying, 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; ſet down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, and 5 is 10 and 3 is 13; which becauſe this is the laſt row, I ſet down: So that by this *Addition*, the whole Debt is found to be *Thirteen Thouſand, Nine Hunared, Ninety Five Pounds.*

A oweth	3564
B ——	5432
C ——	3156
D ——	1843
	13995

Charaſters uſed in Arithmetick

l.	Pounds.
s.	Shillings.
d	Pence.
°.	Degrees.
′	Minutes.
″	Seconds.

Examp. 2. Suppoſe I have ſeveral Creditors to whom I owe ſeveral Sums of Money, I deſire to know the whole.

Therefore begin again (as always in *Addition*) at the Right Hand, I ſay 11 and 10 is 21, and 4 is 25 and 6 is 31; now conſidering how many Shillings there are in 31*d* I find 2*s.* and 7*d.* wherefore I ſet down the odd 7*d.* under the row of Pence, and carry the 2 *s.* to the next row being Shillings, ſaying 2 and 4 is 6, and 8 is 14, and 9 is 23, and 11 is 34, that is 1*l.* 14 *s.* ſet down 14 *s.* and carry the 1*l.* to the next row, ſaying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; ſet down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; ſet down 2 and carry 1: Laſtly, 1 and 1 is 2; ſo that by this *Addition* the whole Debt is, *Two Hundred Twenty Eight Pounds, Fourteen Shillings and Seven Pence.*

l.	*s.*	*d.*
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Examp. 3. Suppoſe at Sea, keeping my Reckoning in Degrees and Minutes, having ſix Days difference of Longitude. I would know how much the whole is.

Say, 13 and 2 is 15, and 9 is 24, and 56 is 80, and 6 is 86; now 60 Minutes making a Degree, ſet down the odd 26 Minutes under the row of Minutes and carry the 1 Degree to the next row, being Degrees; ſaying 1 that I carry'd and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7 ſo that the whole Difference of Longitude made theſe 6 Days, is 7 Degrees and 26 Minutes.

	°	′
1 Day	1	06
2 ——	0	56
3 ——	1	09
4 ——	2	00
5 ——	1	02
6 ——	1	13
	7	26

Subtraction.

S*Ubſtraction* is the taking of a leſs Sum out of a greater, ſubſtractiug the Remainder

	l.	*s*	*d*
Example Suppoſe a Man oweth me	376	13	06
And hath paid me	211	05	08
I deſire to know what remains unpaid, which is	165	07	10

To work this I ſay, 8 from 6 I cannot, but conſidering there is 12 Pence contained in a Shilling, I add, 12, to 6, and ſay 8 from 18, and there remains 10, which ſet down under the Pence; and then having borrowed 10 I go to the next row, and ſay; 1 that I borrowed and 5 is 6, which take out of 13, there remains 7; then proceeding to the Pounds, I ſay, 1 from 6 there remains 5, and 1 from 7 there remains 6; and laſtly, 2 from 3, there remains 1: So there remains due of the ſaid Debt, *One Hundred Sixty Five Pounds Seven Shillings Ten Pence.*

Example 2. Suppoſe the diſtance between two Places to be 1000 Miles, and that I have ſailed 396, and deſire to know how many *Miles* I have to Sail.

Therefore placing 396, under the 1000, I ſay, 6 from 0 I cannot but 6 from 10, there remains 4; proceeding to the next Figure I ſay, 1 that I borrowed and 9 is 10, from 0 I cannot, but 10 from 10 there remains 0: Again, 1 that I borrowed and 3 is 4, from 0 I cannot; but 4 from 10, there remains 6: Laſtly, 1 that I borrowed from 1, there remains 0: So there remains 604 Miles.

Miles
1000
396
604

Example 3. Suppoſe one Place in the Latitude of 51 Deg. 32 Min. and another in the Latitude of 42 Deg. 10 Min. I would know the Difference of Latitude between them.

To do which, Subtract the leſs Latitude out of the greater thus; the leſſer being plac'd undermoſt, ſay, 10 from 32, there remains 22, which place under the Minutes; then for the Degrees, 2 from 11 I cannot, but two from 11 there remains 9, then 1 that I borrowed and 4 is 5, 5 from 5 there remains 0.

°	'
51	32
42	10
09	22

So the Difference of Latitude is 9 Deg. 22 Min.

Multiplication.

M*Ultiplication* is that which ſerves inſtead of many Additions, by which any Number of a greater Denomination is brought into a leſs, as Pounds into Shillings, and Shillings into Pence, and Pence into Farthings, Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by the Number of the leſſer which is contained in the greater, as the multiplying any Number of Pounds by 20 (the Number of Shillings contain'd in a Pound) brings it into Shillings, and ſo of the reſt.

Multiplication conſiſts of Three Parts.

1. The Multiplicand, or Number to be multiplyed
2. The Multiplier, or Number by which to multiply.
3. The *Product* made by the Multiplication.

For the Learner's more ready Procedure herein, It is neceſſary to inſert the Table which is firſt committed to Memory

The Multiplication Table.

$$2\text{ times}\left\{\begin{matrix}2\\3\\4\\5\\6\\7\\8\\9\end{matrix}\right\}\text{is}\left\{\begin{matrix}4\\6\\8\\10\\12\\14\\16\\18\end{matrix}\right\}$$

$$3\text{ times}\left\{\begin{matrix}3\\4\\5\\6\\7\\8\\9\end{matrix}\right\}\text{is}\left\{\begin{matrix}9\\12\\15\\18\\21\\24\\27\end{matrix}\right\}$$

$$4\text{ times}\left\{\begin{matrix}4\\5\\6\\7\\8\\9\end{matrix}\right\}\text{is}\left\{\begin{matrix}16\\20\\24\\28\\32\\36\end{matrix}\right\}$$

$$5\text{ times}\left\{\begin{matrix}5\\6\\7\\8\\9\end{matrix}\right\}\text{is}\left\{\begin{matrix}25\\30\\35\\40\\45\end{matrix}\right\}$$

$$6\text{ times}\left\{\begin{matrix}6\\7\\8\\9\end{matrix}\right\}\text{is}\left\{\begin{matrix}36\\42\\48\\54\end{matrix}\right\}$$

$$7\text{ times}\left\{\begin{matrix}7\\8\\9\end{matrix}\right\}\text{is}\left\{\begin{matrix}49\\56\\63\end{matrix}\right\}$$

$$8\text{ times}\left\{\begin{matrix}8\\9\end{matrix}\right\}\text{is}\left\{\begin{matrix}64\\72\end{matrix}\right\}$$

9 times 9 is 81

10 times 10 is 100

Example 1. I demand how many Shillings there is in 5648 *l.* To anſwer this, multiply the given Number of Pounds by 20, thus; The firſt being o Cypher, ſet down o underneath the firſt Figures; and then proceed to the next Figure, and ſay, 2 times 8 is 16; ſet down 6 under the ſecond Figure and carry 1; then 2 times 4 is 8, and 1 that I carried makes 9; then 2 times 6 is 12, ſet down 2, and carry 1; laſtly, 2 times 5 is 10, and 1 that I carried makes 11. So that 5648 *l.* multiply'd by 20, makes 112960 Shillings.

l.
5648
20
112960

Example. 2. In 276 Degrees how many Minutes?

Firſt ſet down ——————————— 276
Then (becauſe 60 Minutes make a Degree) multiply by ——— 60
The Product is ——————————— 16560

So that I find 276 Degrees multiplied by 60, make 16560 Minutes.

Example 3. Multiply ——— 8765437
By ——————— 32
17530874
26296311
Product 280493984

Multiply ——— 47632867
By ——————— 4352
95265734
238164335
14289860
190531468
207298237184

Diviſion

Diviſion is that which ſerves in the room of many *Subtractions* and is uſeful in reducing all Numbers of a leſſer Denomination into a greater, as Minutes into Degrees, Farthings into Pence, Pence into Shillings, and Shillings into Pounds. It conſiſts of Three Parts, (*viz.*) *Dividend* or the

Number to be divided ; Diviſor, or the Number to divide by ; and the Quotient, alſo if any Number remain it is called the Remainder.

Divisor *Dividend* *Quotient*
23) 7834 (340
69
93
92
14 Remainder

Ex. 1. To divide 7834 by 23: firſt ſay, how many times 2 in 7 ; Or how often 23 in 78, the Anſwer will be 3 times, which place in the Quotient, then multiply the Diviſor 23 by 3, the Figure placed in the Quotient, ſaying 3 times 3 is 9, and 3 times 2 is 6, and place theſe under the two firſt Figures of the Dividend, and draw a Line ; ſubtract 69 from 78 there reſts 9, which ſet underneath, and place a point under 3, to ſhew that its brought down ; place it to the 9, then proceed, ſaying how many times 23 in 93, or how many times 2 in 9 ; which will be 4 times ; place 4 in the Quotient, by which multiply the Diviſor 3 again, placing the Product which is 92 under 93 and draw a Line, and ſubtract it therefrom, the Remainder 1 put under the Line, and ſet down 4 the laſt Figure in the Dividend, putting a Point under it, and place it to the remaining 1: then becauſe there remains but 14, being leſs than the Diviſor 23, and ſo cannot be taken out of it, place a Cypher in the Quotient, and the Work is finiſhed.

Diviſor *Dividend* *Quotient*
6|0) 36|0 (6
36
00

Ex. 2. In 360 Minutes how many Degrees? Here I divide by 60, becauſe 60 Minutes make a Degree, and becauſe the laſt Figure of the Diviſor is a Cyher, I cut it off, and with it the laſt Figure of the Dividend, which is here alſo a Cypher, and divide 36 by 6 (which is the ſame thing as to divide 360 by 60) but becauſe 6 cannot be taken out of 3, therefore I ſay, how many times 6 in 36? The Anſwer is 6 times: which I place in the Quotient, and proceed to multiply the Diviſor 6, by the 6 placed in the Quotient, which produceth 36, which ſubtracted leaves 0, ſo that by this Work it appears that in 360 Minutes there are 6 Degrees juſt.

Example 3. A Ship taken by 253 Men, is valued at 59875*l.* I demand each Man's Share, being equally divided.

Diviſor *Dividend* *Quotient*
253) 59875 (236
506
927
759
1685
1518
167 Remains

253
236
1518
759
506
167
Proof 59875

Firſt, ſay how many times 2 in 5? The Anſwer is two times, which place in the Quotient ; then multiply the Diviſor 253 by 2, the Figure placed in the Quotient, ſaying 2 times 3 is 6, 2 times 5 is 10, ſet down 0, and carry 1; 2 times 2 is 4, and 1 is 5; which ſet down under the 3 firſt Figures of the *Dividend*, from whence being ſubtracted, ſet the Remainder underneath, which will be 92, then take down 7, making a Point underneath, and ſet it after 92 the Remainder; then ſay how often 2 in 9; Anſwer 3 times, (for 4 will prove too many. Then multiply the *Diviſor* 253, as before, by 3, the figure laſt placed in the Quotient, and the Product will be 759, which being ſubtracted from the figures above, the Remainder will be 168, then take down 4, and point it as before, ſetting it after 168, the laſt Remainder: And again, ask the Queſtion, how often 2 is contained in 16? Anſwer 6 times; by which 6, when ſet in the Quotient, multiply the *Diviſor* 253; and the Product is 1518, which place under the laſt *Dividend*, and ſubtract therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finiſhed, each Man's ſhare being 236*l.* and 167*l.* over, which is to be divided among them; which may eaſily be done, by multiplying 167 by 240, and dividing the Product by 253; gives each Man's Share in Pence. The Proof is by multiplying 253 the *Diviſor*, by 236 the Quotient; then taking in 167 the Remainder under the three laſt figures, the Product will make the ſame with the *Dividend*, as you ſee in the Operation.

The Rule of THREE.

IS that, which having three Numbers given, a fourth Number is found in Proportion thereunto; which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the firſt, and the Quotient of the ſaid Diviſion is the Anſwer to the Queſtion.

Example 1. If in 24 Hours a Ship ſails 130 Miles: How many Miles will ſhe ſail with the ſame Gale in 192 Hours or eight Days?

Hours Miles Hours
24 —— 130 —— 192
130
5760
192
24960

24) 24960 (1040 Miles in 192 Hours
24
96
96
00

Here 24 is the firſt Number, 130 the ſecond, 192 the third; wherefore according to the Rule, I multiply 130 and 192 the ſecond and third Numbers together, and divide the Product thereof 24960, by 24 the firſt Number, which gives in the Quotient 1040 Miles, which is the way the Ship will make in 192 Hours the time propoſed.

Exampl 2. If one lb. of Tobacco coſt 6*d.* what will 112lb. coſt?

112
6
12)672 (Pence or 56 Shillings.)

Here the firſt Number being an Unit, which neither multiplies nor divides, it ſaves the labour of Diviſion, and the anſwer is 672d. (for the Anſwer will be of the ſame Name with the ſecond Number) which divided by 12 to bring them into Shillings, gives the Quotient 56 *s.* which is the Price of 112lb. as required.

Example 3. If a Staff of 3 Yards long give a Shadow of 2 Yards, How high is that Caſtle whoſe Shadow is 100 Foot?

Which Queſtion, for the more ready Solution, ſtate thus;

If 6 Foot (which is 2 Yards) give 9 Foot, what ſhall 100 Foot give

By the Operation it appears; the ſaid Caſtle muſt be 150 Foot high.

9
6)900(150 Foot.
6
30
30
00

Example 4. If 564*l.* 12*s.* 6*d.* is to be divided between 165 Men, how much is one Man's Share?

Firſt reduce it all into Pence, by multiplying 564 by 20 (the Shillings in one Pound) taking in the 12 Shillings as you are taught in Multiplication, and the Sum 11292 multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564*l.* 12*s.* 6*d.* Then ſay,

If 165 Men have 135510 Pence, how many ſhall one Man have? And here you ſhould Multiply 135510 by the laſt Number, but here it is 1, which will neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling) gives 68 Shillings, and the 5 remaining are 5 Pence to each Man's Share.

Note The 45 remaining of the firſt Diviſion is only $\frac{45}{165}$ of one Penny, which is little more than a Farthing. *The Opperation follows.*

564*l.* 12*s.* 6*d.*
20
11292
12
22590
11292
165(135510(821 Pence
1320
351
240
0210
0165
45

12)821(68 Shillings equal
72 to *L.* 3 8*s.* 5*d.*
101
96
5 Pence

Note, That the *Rule of Three,* the firſt and third Number muſt be both of one Denomination, and the ſecond muſt be brought into the loweſt Value expreſſed therein, as in the foregoing Example, I work not the Queſtion as it was firſt ſtated, but tranſpoſing the Numbers I put the Denomination of Men firſt and laſt, and the Money in the midſt, to anſwer to that part of the Rule, which requires the firſt and third Numbers to be both of one Name. The Anſwer thereof in the preceding Queſtion, as by the Operation appears, is 821 Pence; which reduced into Shillings, is 68*s.* and 5*d.* or 3*l.* 8*s.* and 5*d.* which is one Man's Share, which was required.

The next thing I ſhall briefly treat of, is *The Extraction of the Square and Cube Roots,* as alſo ſomewhat of their Uſe.

The Extraction of the Square Root.

Example 1. TO extract the Square Root of 7056 proceed thus: Firſt point the given Numbers (that is, put a prick over every other Figure, beginning at the firſt Figure at the Right hand, and note by the way, that ſo many Points as the ſaid Number admits over it, of ſo many Figures conſiſts the Root of the ſaid Numbers, then proceed ſeeking the greateſt Square Number (which is a Number multiplied by it ſelf,) in the firſt point towards the Left-hand (70) which is 64 conſtituted of 8 multiplied into it ſelf; for 8 times 8 is 64. The Root of the ſquare Number which is 8, place in the Quotient and ſubſcribe the ſquare Number (64) under the ſaid firſt Point, ſubtracting it therefrom, and ſetting down the Remainder (6) underneath: To this Remainder bring down the next Point (56) then drawing a crooked Line on the Left hand of the Dividend (656) double the Quotient, and place it (*viz.* 16) therein, calling it the Diviſor, ſeek how often the Diviſor is contained in all the Figures of the Dividend, ſave the laſt to the Right-hand, (*viz.*) How many times 16 in 64? The Anſwer is 4 times, which place in the Quotient, and alſo on the Right-hand of the Diviſor (16) then multiply the Diviſor (164) by the 4 laſt placed in the Quotient, and put the Product, which is 656, under the Dividend, ſubtracting it therefrom; which done, nothing remains. So that the Square Root of 7056 is 84.

$\dot{7}0\dot{5}6$(84 Root
64
164)656 Diviſor
656
000

The Square Root is applied to Navigation as follows.

Any two ſides of a Right-angled Plain-Triangle being given, the third is found by the Extraction of the Square Root.

Example 2. Suppoſe a Ship to have made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Diſtance to be required, the ſaid Diſtance is found by the Extraction of the Square Root, as follows.

The Rule. Square the Difference of Latitude and Departure ſeverally (that is, multiply each by it ſelf) and from the Sum of both the Squares added together, extract the Square Root, which will be the Diſtance required.

Ex

Example.

Difference of Lat. 87. The Departure 71. Square Diff. Latit. — 7569
Multiplied by it ſelf 87. Multip. by ſelf 71. SquareDeparture —— 5041
609 71 Sum 12610
696 497
The Square —— 7569 The Square 5041

12610(112, the Diſtance required
1
21)026
21
222) 510
444
66

By this Operation it appears, that the Diſtance, omitting the Fraction, is 112 Miles.

Examp. 2. Suppoſe a Ship's Diſtance to be 111 Miles, and her Departure 57 Miles, and the Difference of Latitude to be required; the ſaid Difference of Latitude is found by the Extraction of the Square Root, as follows.

The Rule. From the Square of the Diſtance ſubtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required.

Example. The Diſtance ——— 111 ——— The Departure —— 57
Multiplied by it ſelf ——— 111 ——— multiplied by it ſelf — 57
111 399
111 285
111 Sq. of Departure —— 3249
Square of the Diſtance 12321
Square of the Dep. ſubtract 3249 9072(95 Diff. Lat. required
Remains 9072 81
185)972
925
47

The Difference of Latitude, as by the Operation appears, is 95 Miles omitting Fractions.

If the Departure be required, the Rule is, from the Square of the Diſtance, ſubtract the Square of the Difference of Latitude, and the Square Root of the Remainder is the Departure required. The Operation, for Brevity ſake is omitted.

Having proceeded thus far in ſhewing the *Practitioner* how to find the Diſtance, Difference of Latitude and Departure (any two of them being given) without *Trigonometry*, I ſhall ſhew the manner of finding the Courſe exact enough for common Uſe) without the ſaid Operation, which is done as follows.

The Proportion to find the Courſe. As the Sum of the Hypothenuſe (or Diſtance) and half the greater of the other two Legs (*viz.*) if the Difference of Latitude be moſt, half that, but if the Departure be moſt, half that; I ſay; as the Sum of theſe two is in Proportion to the leſſer (or remaining) Leg, ſo is 85 to the Angle (in Degrees) oppoſite to the leſs Leg; which is the Courſe, when the Departure is leſs than the Difference of Latitude, otherwiſe 'tis the Complement of the Courſe.

Examp. Admit a Ship's Diſtance to be 110; the Difference of Latitude to be 88, and the Departure 66, and the Courſe required.

Firſt, add the Diſtance, and half the greater Leg into one Sum.

The Diſtance is ——————— 110
Half the greater Leg (88) is ——————— 44
The Sum ——————— 154

Having thus done, ſay by the *Rule of Three.*

As the ſaid Sum 154 to 66 the leſſer Leg, ſo is 86 to the Courſe

To bring out the odd Minutes, multiply the Remainder of the Diviſion 132 by 60 (the Number of Minutes contained in a degree) and divide the Product by the *Diviſor* (154) and the Quotient of the ſaid *Diviſion* gives for the Anſwer 51 Minutes: So that the Courſe required is 36 deg. 51 min.

```
             66
            ----
            516
           516
     154)5676(36deg     51 min
           462           132
          -----
          1056            60
                      ---------
           924    154)7920(51
          -----        770
           132        -----
                       220
```

Example 3. *Extraction of the Square Root.* Suppoſe a Rope of 5 Inches Compaſs, and another Rope of double the ſtrength is required. The Dimenſions of the ſaid required Rope are found by the *Extraction of the Square Root*: For ſhould it be ſuppoſed that a Rope of 10 Inches Compaſs, is but double the ſtrength of a Rope of 5 Inches; upon Proof it is manifeſtly falſe, for the ſaid Rope of 10 Inches is 4 times the ſtrength of that of 5.

The Rule. Take the Compaſs of the given Rope (*viz.* 5) and multiply that by it ſelf; which Product (becauſe the other Rope is to be twice as ſtrong) multiply it by 2, and the Square Root of the Product is the Compaſs of the Rope required. In

Example. The given Rope's Compaſs 5 Inches, Extract the Root 50(7

```
Multiplied by it ſelf ——————— 5          49
                             ----       ----
The Square ——————————————— 25             1
Multiplied by ————————————  2
                           ----
                            50
```

So that by the Operation it appears a Rope to be twice the ſtrength of the given Rope of 5 Inches Compaſs, muſt be 7 Inches and a little better.

If it's deſired to know the weight of one Rope by another, 'tis as follows

The Proportion is, As the Square of the Compaſs of the one Rope, is to the Square of the Compaſs of the other; ſo is the weight of the one to the weight of the other, Length for Length: *Ex.* Suppoſe a Cable of 10 Inches to weigh 25 Hundred, and the weight of a Cable of 8 Inches required, Say, As 100 (the ſquare of 10) is to 64 the ſquare of 8; ſo is 25 C. the weight of one Cable to 16 C. the weight of the other required *Ex-*

Extraction of the Cube Root.

I Shall firſt, as neceſſary, inſert a Table of the Cubes of the Nine Digits, when ought to be committed to Memory.

Cubes of the Nine Digits	1	001	4	064	7	343
	2	008	5	125	8	512
	3	027	6	216	9	729

Example 1. Extract the Cube Root of 12167.

Firſt, Point the given Number (*i. e.*) put a Prick over every third Figure (beginning at the Right Hand) then ſeek the greateſt Cube in the firſt Point (*viz.* 12.) which is 8, the Cube Root whereof (which is 2) place in the Quotient; ſubtract the Cube (8) from the firſt Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this the Reſolvend, then draw a Line underneath it, then ſquare the Quotient 2, which is 4; multiply the ſaid Square (4) by 300, which makes 1200; place this under the Reſolvend, and call it the Triple Square. Again, multiply the Quotient (2) by 30 which makes 60; place this under the Triple Square, and call it the Triple Quotient; add theſe two (*viz.*) Triple Square and Triple Quotient, into one Sum, and call it the *Diviſor*; ſeek how often this *Diviſor* is contained in the Reſolvend, which is three times; which three placed in the Quotient, multiply the Triple Square by the Figure 3 laſt placed in the Quotient, and ſubſcribe the Product underneath the *Diviſor*; ſquare the ſaid Figure (3) laſt placed in the Quotient, and thereby multiply the Triple Quotient, and place it underneath the laſt Product; Cube the Figure (3) laſt placed in the Quotient, and place it under the preceding Products. Laſtly, add theſe three Products into one Sum, ſubtracting the ſaid Sum from the Reſolvend, ſubſcribe the Remainder; to which Remainder had there been any more Figures, the next Point muſt have been brought down, and the proceeding Work repeated from the ſquaring of the Quotient, until all the Figures are ſo brought down; But in this Example there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167 appears to be 23, nothing remaining.

```
12167(23 Root
 8
————
 4167 Reſolvend
 1200 Triple Square
   60 Triple Quotient
 ————
 1260 Diviſor
 ————
 3600
  540
  027
 ————
 4167
 ————
  000
```

Example 2. *Applied.* Suppoſe a Ship of 300 Tun, 75 Foot by the Keel, 29 Foot and a half at the Beam, and 14 foot deep in the Hold; another Ship is deſired of the ſame Mould and Shape of 500 Tun, the ſeveral Dimenſions of the Ship are found by the Extraction of the Cube Root. *Example.* Beginning with the Keel. Firſt, Cube the length of the given Keel, which is done by multiplying it into it ſelf, and then multiplying the Product by it again.

Then ſay by the Rule of Three; As 300 Tun the one Ship's Burthen; to 500 Tun the other Ship's Burthen; ſo is 421875 the Cube of the other Ship's Keel's Length, to the Cube of the other Keel's Length. Which being wrought by the Rule of Three, gives 703125: From which extract the Cube Root, and that will be the Length of the Keel required.

In this Extraction 3 Cyphers are added to bring out the Fraction, the Operation therewith being the ſame as if there had been more Figures in the propoſed Number; the Operation gives for the Length of the Keel required 88 Foot $\frac{9}{10}$ parts.

Thus having found one of the Dimenſions, the reſt may be found without the Extraction of the Roof, by the Rule of Three.

Thus, ſuppoſe the next thing I would find be her Breadth by the Beam, ſay, As the Length of the one Ship's Keel 75, is to the length of the other 89 *fere*; So $29\frac{1}{2}$ Foot, the Breadth of the one Ship by the Beam, to the Breadth of the other, which by the Rule of Three, gives 35 Foot

So you may find the Depth in the Hold, *&c.*

Example 3. Suppoſe an Iron Shot 4 Inches Diameter to weigh 9lb. required, the Diameter of a Shot of any other Weight, ſuppoſe of 72lb. This is alſo done by the Extraction of the Cube Root as follows:

Firſt, ſay, by the Rule of Three.

As 9lb. the weight of one Shot, to 72lb. the weight of the other; ſo is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter; which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

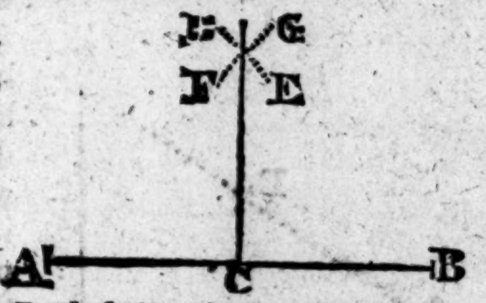
```
      75 given Keel
      75
    -----
     375
    525
    -----
    5625
      75
    -----
   28125
  39375
  -------
  421875 Cube given Keel
  -------
   .  .
  703125(86 9/10 Root
  512
  191125 Reſolvend
   192000 Triple Square
      240 Triple Quotient
   19440 Diviſor
  153600
   15360
     512
  169472
   21653000 Reſolvend
    2323200 Trip Square
       2640 Tr Quotient
    2325840 Diviſor
    2090880
     213340
        729
  21123369
     529631 Remainder
```

But if it were required to find the Weight of a Shot by the Diameter it's done thus, by the Rule of Three.

As the Cube of the one Shot's Diameter, to the Cube of the other; So is the Weight of the one Shot, to the Weight of the other required.

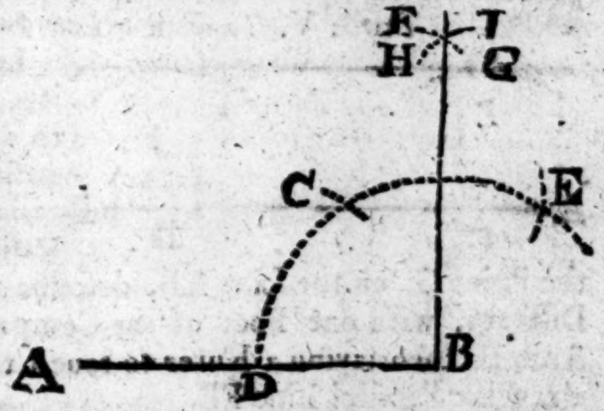
And thus much for the Arithmetical Part of this Treatiſe.

Prob. I. *To raiſe a Perpendicular from any Point propoſed, in a given Right Line.*



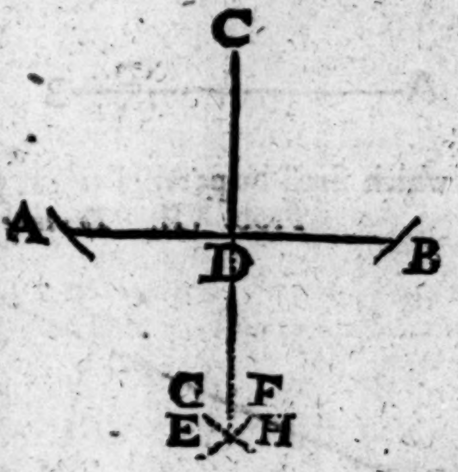
LET the Line given be AB, and the Perpendicular to be raiſed from the Point C; to do which ſet off the two equal Diſtances, CA and CB. Then the Compaſſes being opened to any convenient Diſtance bigger than AC and CB with one Foot of the Compaſſes in the Point A, deſcribe the Arch DE; then with the ſame Extent, and one Foot in the Point B, deſcribe the Arch FG, then draw the Perpendicular from the Point C, through the Interſection (or Cutting) of the two Arches FG and DE, which was required.

Prob II. *To raiſe a Perpendicular on the End of a Line.*



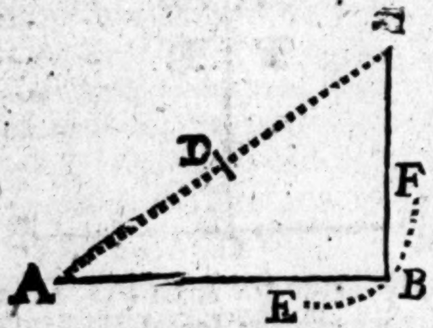
Let the Line given be AB, the Perpendicular to be raiſed from the Point B, to do which, with one Foot of the Compaſſes at B, with any convenient Diſtance, as BD, ſweep an Arch; then with the ſame Extent, one Foot of the Compaſſes being in the Point D, mark the ſaid Arch at the point C, and one Foot being at C, mark it at E; then with the ſame Diſtance, one Foot of the Compaſſes being in the Point C, deſcribe the Arch FG; and placing the Compaſſes in the point E, deſcribe the Arch HI; then from the point B, and through the Interſection of the two Arches FG and HI draw the Perpendicular which was required.

III. *To let fall a Perpendicular from a Point aſſigned over a given Right Line.*



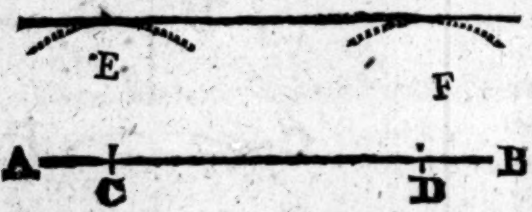
Let AB be the Line given, C the point over the Line from which the Perpendicular is to fall, to do which, place one Foot of the Compaſſes in the Point C, then opening them to a convenient Diſtance, mark the Line AB in two Points with the ſaid Diſtance, as in the Points A and B; then with the Foot of the Compaſſes in the Point A, deſcribe the Arch EF, and with one Foot in the Point B, deſcribe the Arch GH; then from the Point C, and thro' the Interſection of the ſaid two Arches, draw the Perpendicular CD which was required

Prob. IV. *Another way to let fall a Perpendicular from a given Point on a given Right-Line.*



Let the Line given be AB, upon which let it be required to let fall a Perpendicular from the Point C; to do which from the Point aſſigned C, draw the Line CA; which Line divide into two equal Parts, as in the Point D, then one point of the Compaſſes reſting in the point D, with the ſame Diſtance (*viz.* of half the Line AC) deſcribe the Arch EF; then from the point C, to the Interſection of the Arch EF with the Line AB, draw the Perpendicular CB.

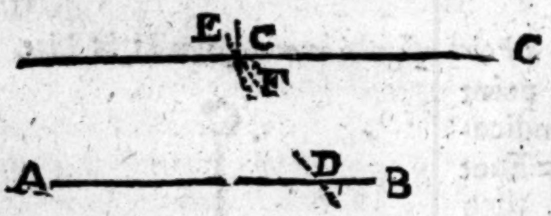
Prob. V. *To draw a Line parallel to a Line given.*



Let AB be a Line given, to which it is required to draw a Line parallel; to do which, firſt take in the Compaſſes the Diſtance at which the parallel Line is to be drawn, and then ſetting one Foot of the Compaſſes in the Point C, on the Line AB, deſcribe the Arch E; and with the ſame Diſtance, with one Foot of the Compaſſes in the point D, deſcribe the Arch F, then laying a Ruler to touch the Convexity of the two Arches, draw the Parallel Line FE.

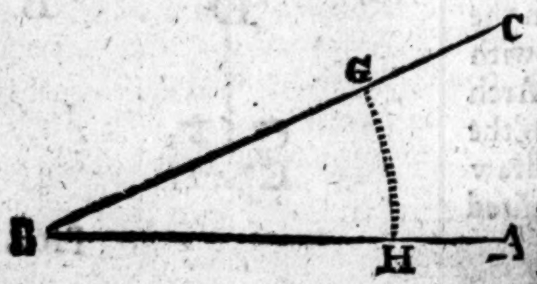
Prob. VI. *To draw a Right Line parallel to a given one, that ſhall paſs thro' a Point given.*

Suppoſe AB the given Line, and it's required to draw a Line parallel thereto, that ſhall paſs thro' a given Point as C.

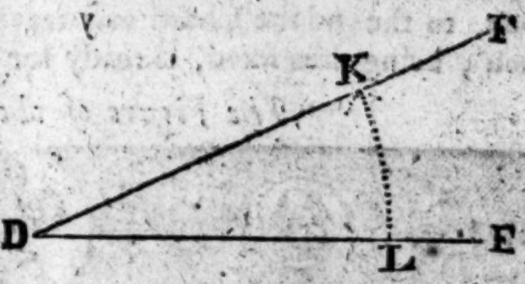


Set one Foot of the Compaſſes in C, with the other at any Diſtance croſs AB in D, and with that Diſtance from any Point, as A, of the Line AB deſcribe an Arch EF; then from C with the Diſtance AD croſs that Arch in G; draw the Line CG which ſhall be parallel to the given Line AB as was required.

Prob. VII. *To make an Angle equal to any Angle given.*

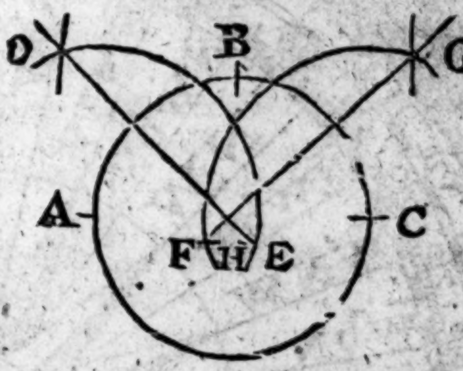


Suppoſe ABC an Angle given, and it is required to make another Angle equal thereto: To do this, firſt draw the Line DE, then with any convenient Diſtance leſs than AB, deſcribe the Arch GH, then placing the Compaſſes at D, with the ſame Diſtance which ſwept the Arch GH,



GH ſweep the Arch KL; take the Arch GH, in the Compaſſes and ſetting one Foot in the Point L, croſs the Arch LK in the point K, then thro' the Point K draw the Line DKF, then is the Angle EDF equal to the Angle ABC as was required.

Prob. VIII. *To bring any three Points not Scituate in a right Line into the Circumference of a Circle.*



Let the three points thro' which the Circle is to paſs, be ABC: Take above half the Diſtance, between the two points A and B in the Compaſſes; and one Foot in the Compaſſes being in the point A, with the ſaid Diſtance deſcribe the Arch ED, and with the ſame Diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch ED in the points E, and D, and draw the right Line ED; then take above half the Diſtance between the points C and B in the Compaſſes, and one Foot of the Compaſſes being in the point C, with the ſaid Diſtance deſcribe the Arch FG; and with the ſame Diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch FG, in the Points F and G, and draw the Right Line FG. Now where the two Right lines DE and FG being continued, interſect each other (*viz.* in the point H) in the Center of the Circle, which was required.

The Deſcription of the Mariners Compaſs.

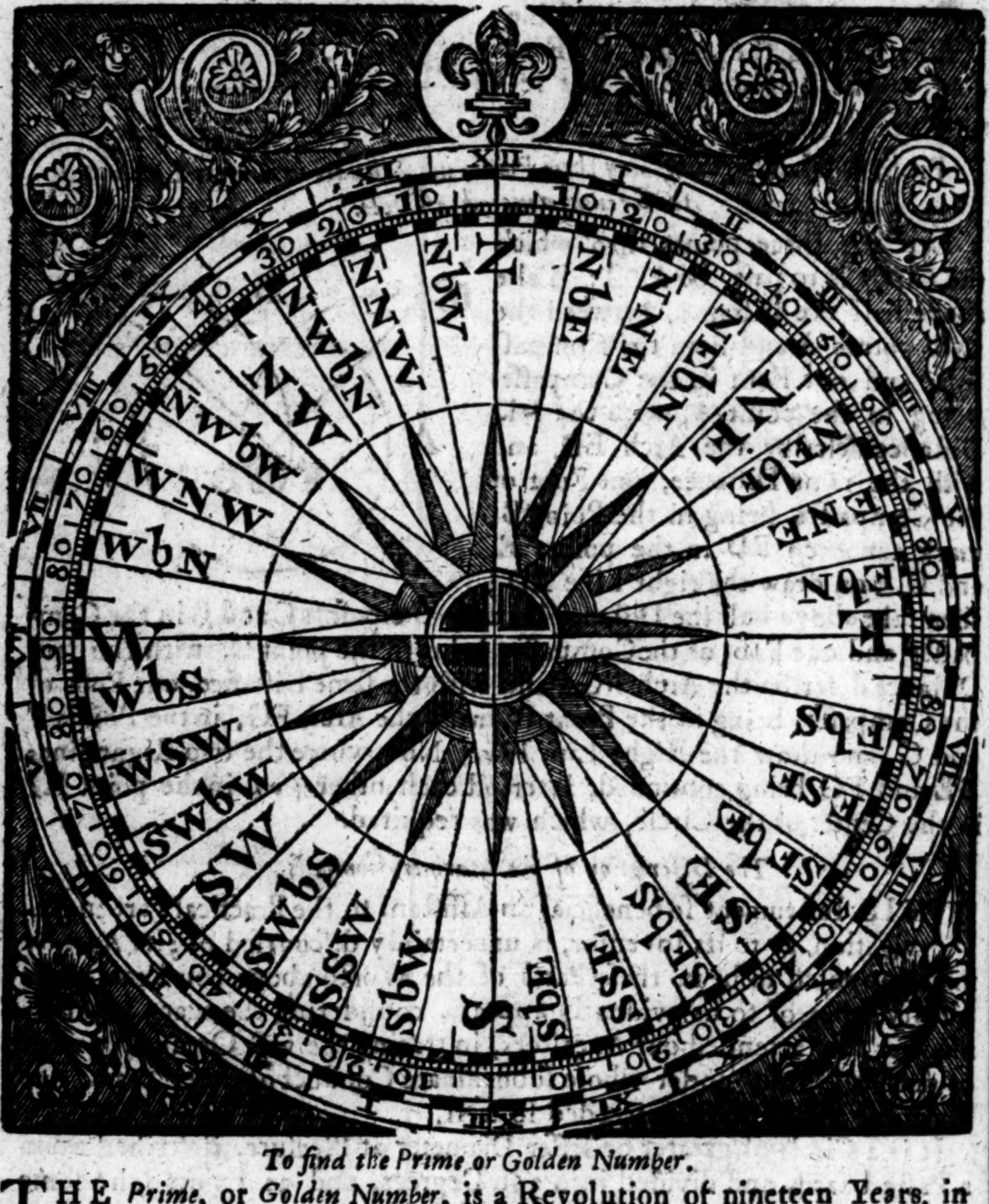
THIS Inſtrument ſo beneficial an Aſſiſtant to the Practical Part in Navigation, as to its Inventor, is uncertainly diſcourſed of; its Age, by ſome ſuppoſed to be in theſe Parts of the World about 300 Years; the Utility whereof to us evidently appears, conſidering the many Inconveniencies that attended our Anceſtors, in tracing the vaſt Ocean, for want of ſuch a Guide, under whoſe ſubordinate Conduct of later Years, our Maritime Affairs have ſucceeded ſo well.

It is a Circle of greater or leſſer Diameter at Pleaſure, deſcribed upon a Paſte-board, and divided into 360 Degrees, and 32 Points (and ſome times into 24 Hours) each Point containing 11 deg. 15 min. or 3 quarters of an Hour; as in the following Figure.

The Circle being thus divided upon the Chard, or Paſte-board, there are paſted on the other ſide of the ſaid Chard or Paſte-board, two Wires, which Wires being touched with a Loadſtone, and the Chard hung at the Center, upon a Pin, fixed in a Box, its Poſition becomes North and South;

and the ſaid Box being covered with a Glaſs, and hung in another ſquare Box, to the end the Chard may traverſe notwithſtanding the Ship's Motion; being thus fixed, is ready for Uſe.

The Figure of the Mariners Compaſs.



To find the Prime or Golden Number.

THE *Prime*, or *Golden Number*, is a Revolution of nineteen Years, in which Term the Moon returns to make the ſame Aſpects with the Sun on the ſame Day of the Month (moſt commonly) that they were on nineteen Years before.

To find which add one to the Year of our Lord, and divdie by 19, the Remainder is the Prime or Golden Number.

Example. To find the *Golden Number* for the Year 1731, add 1; which makes 1732; which divide by 19.

19)1732(91
171
22
19
3

The Remainder 3 is the Golden Number for the Year 1731.

To find the Epact.

THE *Epact* is the Number of Days that the Solar Year of 365 Days exceeds the Lunar Year (or 12 Reſolutions of the Moon to the Sun of 354 Days, the Difference being 11 Days: When the Golden Number is 1, the Epact is 11, when 2, the Epact is twice 11 or 22, when 3 thrice 11, or 33 rejecting 30) that is 3, &c. and its thus found: Divide the Prime by 3, if 0 remain, the Epact is the ſame with the Prime, if 1 remain, add 10, if 2 add 20, to the Prime, the Sum (rejecting 30, if need be) is the Epact.

Example. In the Year 1732, the Golden Number is 4; which divide by 3, there remains 1; for which 10 added to the Golden Number 4 makes the Epact 14.

In the Year 1729, the Golden Number is 1, which added to 10 (becauſe 1 cannot be divided by 3) makes 11 for the Epact.

In the Year 1731 the Golden Number is 3, which divided by 3, there remains 0, therefore the Epact is 0.

Or multiply the Golden Number by 11, and divide the Product by 30, the Remainder is the Epact.

To find the Moon's Age.

ADD to the Epact for *March* 1, for *April* 2, for *May* 3, for *June* 4, for *July* 5, for *Auguſt* 6, for *September* 8, for *October* 8, for *November* 10, for *December* 10, for *January* 0, for *February* 2.

Having added to the Epact the Number for the Month, according to the Rule foregoing, add thereto the Day of the Month, for which the Moon's Age is required. Theſe three Sums added together, if leſs than 30 is the Moon's Age; if more than 30, take 30 from it as often as may be, the Remainder is the Age of the Moon. The Moon's Age ſubtracted from 30, leaves the Day of the Change. Again, 15 added to, or ſubtracted from the Day of Change, leaves the Day of full Moon.

Example. Suppoſe it were required to find the Moon's Age for the fifth Day of *September*, 1732.

Firſt ſet down the Epact for that Year ——— ——— 14
To which add the Number for the Month which is——— 8
To which add the Day of the Month, which is —— —— 5
Sum, gives the Moon's Age—— ——— 27 Days

Then out of 30,
Take—— —— 27 The Moon's Age
Remains——— 3 Days to Change
Add——— 15
Makes —— 18 Days to the full Moon.

To find the Moon's Southing by her Age, ſee in the Uſe of the Tide-Table, which follows immediately after it.

To find the Dominical Letter.

TAKE the Year and it's fourth Part, and add 4 to it; then divide that Sum by 7, and ſubtract what remains from 7, the Remainder ſhews the thing required; accounting the Letter A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, G for 7.

Suppoſe the Dominical Letter was required for the Year — 1731
Firſt, ſet down the Year — 1731
Then the 4th part, which omitting Fractions is — 432
To which add — 4
2167
The Sum divided by — 7)2167(309
21
067
63
04

The Remainder after Diviſion is 4, which being ſubtracted from 7, leaves 3; which ſhews it muſt be the third Letter, which is C, the Dominical Letter for the Year 1731. But when it is Leap-year, there are two Dominical Letters, and then the Letter thus found ſerves from the laſt of *February*, to the end of the Year.

To find the Cycle of the Sun.

ADD to the Year 9, divide the Sum by 28, the Remainder is the Cycle of the Sun.

Suppoſe it be required for the Year 1731
Then add — 9
Divide by — 28)1740(62
168
60
56
04

By the Operation it appears that 4 is the Cycle of the Sun for the Year 1731, being the Remainder after the Diviſion.

Note, *Hillary* Term begins *Jan.* 23, and ends, *Feb.* 12.

Eaſter Term begins 17 Days after *Eaſter-day*, and ends *Monday* before *Whitſunday*.

Trinity Term begins on *Friday* after *Trinity Sunday*, and ends 19 Days after.

Michaelmas Term begins *October* 23, and ends *November* 28.

A Table of the Moon's Age for the year 1731.

Months		D.	H.
January	Firſt quart.	04	09M
	Full moon	12	04M
	Laſt quart.	19	11 A
	New moon	26	05 A
February	Firſt quart.	02	11 A
	Full moon	11	12 A
	Laſt quart.	18	11M
	New moon	25	07M
March	Firſt quart.	04	01A
	Full moon	12	04A
	Laſt quart.	19	09A
	New moon	26	06A
April	Firſt quart.	03	08M
	Full moon	11	06M
	Laſt quart.	18	05M
	New moon	25	05M
May	Firſt quart.	03	01M
	Full moon	10	04A
	Laſt quart.	17	01A
	New moon	24	04A
June	Firſt quart.	01	05A
	Full moon	09	02M
	Laſt quart.	15	09A
	New moon	23	06M

Months		D.	H
July	Firſt quart.	01	06M
	Full moon	08	09M
	Laſt quart.	15	06M
	New moon	22	09 A
	Firſt quart	30	07 A
Auguſt	Full moon	06	05A
	Laſt quart.	13	05A
	New moon	21	01A
	Firſt quart	29	04M
September	Full moon	05	01M
	Laſt quart.	12	05M
	New moon	20	08M
	Firſt quart.	27	02 A
October	Full moon	04	08M
	Laſt quart.	11	09 A
	New moon	19	10 A
	Firſt quart.	26	12 A
November	Full moon	02	10 A
	Laſt quart.	10	03 A
	New moon	18	11M
	Firſt quart.	25	10M
December	Full moon	02	11M
	Laſt quart.	10	11M
	New moon	18	01M
	Firſt quart	24	10 A

There will four Eclipſes happen this Year, three of the Sun and one of the Moon.

The firſt will be of the Moon, on the 8th of *June*, 3 Digits viſible.
The ſecond will be of the Sun, on the 23d of *June*, inviſible
The third will be of the Sun, on the 23d of *December*, inviſible.
The fourth will be of the Sun, on *December* the 17th, inviſible.

Months		D.	H.
January	Full moon	01	04M
	Laſt quart	09	06M
	New moon	15	12M
	Firſt quart	23	09M
	Full moon	30	12M
February	Laſt quart	07	10 A
	New moon	14	11 A
	Firſt quart	21	09A
	Full moon	29	03A
March	Laſt quart	08	11M
	New moon	15	08M
	Firſt quart	22	10M
	Full moon	30	11M
April	Laſt quart.	06	09M
	New moon	13	05A
	Firſt quart	21	01A
	Full moon	29	01 A
May	Laſt quart	06	06M
	New moon	13	02M
	Firſt quart	20	04A
	Full moon	28	02A
June	Laſt quart	04	01A
	New moon	11	00N
	Firſt quart.	19	10M
	Full moon	26	12M

Months		D.	H.
July	Laſt quart	03	09 A
	New moon	10	11 A
	Firſt quart	18	12 A
	Full moon	26	09M
Auguſt	Laſt quart	02	04M
	New moon	09	03 A
	Firſt quart	17	12 A
	Full moon	24	05 A
	Laſt quart	31	02 A
September	New moon	08	05M
	Firſt quart	16	03M
	Full moon	23	04M
	Laſt quart	29	11 A
October	New moon	07	01 A
	Firſt quart	15	02 A
	Full moon	22	11M
	Laſt quart	29	04 A
November	New moon	06	05 A
	Firſt quart	14	01M
	Full moon	20	10 A
	Laſt qnart	28	10M
December	New moon	06	19M
	Firſt quart	13	01 A
	Full moon	20	11M
	Laſt quart	28	05M

There will happen five Eclipſes this Year.

The firſt of the Moon, on the 28th of *May*, inviſible.

The next Two of the Sun, the firſt the 11th of *June*, the latter the 6th of *November*, both inviſible.

The next of the Moon, on the 20th of *Nov.* at 10 a Clock viſ. & total.

The laſt of the Sun, the 6th of *Decem.* at 9 in the Morning viſible.

Months		D.	H.
January	New moon	05	01M
	Firſt quart	11	11A
	Full moon	18	12 A
	Laſt quart	26	02M
February	New moon	03	01 A
	Firſt quart	10	10M
	Full moon	17	05A
	Laſt quart	25	07 A
March	New moon	04	11 A
	Firſt quart	11	09A
	Full moon	19	10M
	Laſt quart	27	09A
April	New moon	03	09M
	Firſt quart	10	07M
	Full moon	18	03M
	Laſt quart	25	08 A
May	New moon	02	05A
	Firſt quart	09	07A
	Full moon	17	07A
	Laſt quart	25	04M
June	New moon	01	01M
	Firſt quart	08	09 A
	Full moon	15	02 A
	Laſt quart	23	02A
	New moon	30	10M

Months		D.	H.
July	Firſt quart	07	12 A
	Full moon	15	09 A
	Laſt quart	22	09 A
	New moon	29	07 A
August	Firſt quart	06	04 A
	Full moon	13	08 A
	Laſt quart	21	04M
	New moon	28	07M
September	Firſt quart	05	08M
	Full moon	12	05 A
	Laſt quart	19	01 A
	New moon	26	11 A
October	Firſt quart	04	12A
	Full moon	12	05M
	Laſt quart	18	12 A
	New moon	26	05 A
November	Firſt quart	03	02 A
	Full moon	10	01 A
	Laſt quart	17	02 A
	New moon	25	00 A
December	Firſt quart	03	03M
	Full moon	09	12 A
	Laſt quart	17	05M
	New moon	25	07M

The Year 1733 *hath four Eclipſes, two of the Sun and two of the Moon.*

Whereof one of each are viſible, being both in the Month of *May*, *viz.* the Sun will be eclipſed on the ſecond Day, viſible ten digit about 5 in the Afternoon; and on the 17th Inſtant the Moon will be totally Eclipſed about 7 in the Afternoon.

A Table of the Moons Age for the Year 1734.

Months		D.	H.
January	Firſt quart	01	03 A
	Full moon	08	11 M
	Laſt quart	15	11 A
	New moon	23	12 A
	Firſt quart	31	01 M
Febru.	Full moon	06	05 M
	Laſt quart	14	07 A
	New moon	22	01 A
March	Firſt quart	01	11 M
	Full moon	08	01 A
	Laſt quart	16	01 A
	New moon	23	12 A
	Firſt quart	30	09 A
April	Full moon	07	04 M
	Laſt quart	15	05 M
	New moon	22	10 M
	Firſt quart	29	06 M
May	Full moon	06	07 A
	Laſt quart	14	06 A
	New moon	21	05 A
	Firſt quart	28	04 A
June	Full moon	05	11 M
	Laſt quart	13	04 M
	New moon	20	01 M
	Firſt quart	27	02 M
July	Full moon	05	03 M
	Laſt quart	12	01 A
	New moon	19	08 M
	Firſt quart	26	04 A
Auguſt	Full moon	03	05 A
	Laſt quart	10	09 A
	New moon	17	05 A
	Firſt quart	25	08 M
September	Full moon	02	06 M
	Laſt quart	09	05 M
	New moon	16	04 M
	Firſt quart	24	01 M
October	Full moon	01	05 A
	Laſt quart	08	03 A
	New moon	15	06 A
	Firſt quart	23	07 A
	Full moon	31	04 M
November	Laſt quart	07	01 M
	New moon	14	11 M
	Firſt quart	21	12 M
	Full moon	29	03 A
December	Laſt quart	06	01 A
	New moon	14	06 M
	Firſt quart	22	03 M
	Full moon	29	02 M

The Year 17334 *hath two Eclipſes, both of the Sun*

The firſt will be on *April* 22d, inviſible.

The ſecond will be on the 15th of *October*, inviſible.

A Table of the Moon's Age for the year 1735.

Months		D.	H.
January	Laſt quart.	05	03M
	New moon	13	02M
	Firſt quart.	20	04A
	Full moon	27	01A
February	Laſt quart.	03	07 A
	New moon	11	08 A
	Firſt quart.	19	03 M
	Full moon	25	12 A
March	Laſt quart.	05	01 A
	New moon	13	00N
	Firſt quart.	20	01 A
	Full moon	27	11 M
April	Laſt quart.	04	06M
	New moon	12	01 M
	Firſt quart.	16	09 A
	Full moon	25	11 A
May	Laſt quart	03	10 A
	New moon	11	09M
	Firſt quart.	18	05M
	Full moon	25	12M
June	Laſt quart.	02	01 A
	New moon	09	05A
	Firſt quart.	16	01 A
	Full moon	24	03M
July	Laſt quart.	02	01M
	New moon	09	01M
	Firſt quart	15	11A
	Full moon	23	07A
	Laſt quart.	31	11M
Auguſt	New moon	07	08A
	Firſt quart.	14	10M
	Eull moon	22	11M
	Laſt quart..	29	09M
September	New moon	05	05A
	Firſt quart.	13	03M
	Full moon	21	02M
	Laſt quart.	28	06M
October	New moon	05	03M
	Firſt quart.	12	07A
	Full moon	20	05A
	Laſt quart.	27	04A
November	New moon	03	03A
	Firſt quart.	11	01A
	Full moon	19	05M
	Laſt quart.	26	03M
December	New moon	03	07M
	Firſt quart.	11	10M
	Full moon	18	05 A
	Laſt quart.	25	03 A

The Tear 1735 hath four Eclipſes, two of the Sun, and two of the Moon.

The firſt will be an Eclipſe of the Moon, *March* the 27th inviſible.
The 2d will be an Eclipſe of the Sun, on *April* the 11th inviſible.
The third of the Moon, *Sept.* the 21ſt at 2 in the Morn. viſ. 7 Digits
The 4th will be of the Sun, on the 4th of *October* inviſible.

A Table of the Moon's Age for the year 1736

Months		D.	H.
January	New moon	02	01M
	Firſt quart	10	02M
	Full moon	17	04M
	Laſt quart	24	02M
	New moon	31	08 A
Febru.	Firſt quart	08	04A
	Full moon	15	02A
	Laſt quart	22	02A
March	New moon	01	04A
	Firſt quart	09	04M
	Full moon	15	12 A
	Laſt quart	23	06M
	New moon	31	09M
April	Firſt quart	07	02A
	Full moon	14	11M
	Laſt quart.	21	11A
	New moon	29	10A
May	Firſt quart	06	10 A
	Full moon	13	08A
	Laſt quart	22	02A
	New moon	29	08M
June	Firſt quart	05	05M
	Full moon	12	07M
	Laſt quart	20	66M
	New moon	27	05A
July	Firſt quart	04	01 A
	Full moon	11	07 A
	Laſt quart	19	08 A
	New moon	27	01M
Auguſt	Firſt quart	02	09A
	Full moon	10	10M
	Laſt quart	18	09M
	New moon	25	09M
September	Firſt quart	01	07M
	Full moon	09	02M
	Laſt quart	16	09 A
	New moon	23	06 A
	Firſt quart	30	08 A
October	Full moon	08	09 A
	Laſt quart	16	07M
	New moon	23	03M
	Firſt quart	30	00N
November	Full moon	07	02 A
	Laſt quart	14	06 A
	New moon	21	03 A
	Firſt quart	29	07M
December	Full moon	07	05M
	Laſt quart	14	04M
	New moon	21	05M
	Firſt quart	29	03M

This Year hath ſix Eclipſes, four of the Sun and two of the Moon.

The firſt will be of the Sun, *March* the 1ſt, inviſible.

The ſecond will be of the Moon, *March* the 15th, viſible and total.

The third will be of the Sun, *March* the 30th, inviſible.

The fourth will be of Sun, *Auguſt* the 25th, inviſible.

The fifth will be of the Moon, *Sept.* 9th, at 2 in the Morn, viſ. & tot.

The ſixth will be of the Sun, *September* the 23d. inviſible.

Months		D.	H.
January	Full moon	05	06 A
	Laſt quart.	12	03 A
	New moon	19	08 A
	Firſt quart.	27	10 A
February	Full moon	04	04M
	Laſt quart.	11	02M
	New moon	18	03A
	Firſt quart.	26	02A
March	Full moon	05	03A
	Laſt quart.	12	02A
	New moon	20	08M
	Firſt quart.	28	03M
April	Full moon	04	01M
	Laſt quart.	11	02M
	New moon	19	01M
	Firſt quart.	26	02A
May	Full moon	03	09M
	Laſt quart.	10	03A
	New moon	18	04A
	Firſt quart.	25	10A
June	Full moon	01	06A
	Laſt quart.	09	02M
	New moon	17	05M
	Firſt quart.	24	05M

Months		D.	H
July	Full moon	01	03M
	Laſt quart.	08	09A
	New moon	16	03A
	Firſt quart	23	00A
	Full moon	30	02 A
Auguſt	Laſt quart.	07	01 A
	New moon	14	12 A
	Firſt quart	21	08 A
	Full moon	29	03M
September	Laſt quart.	06	04M
	New moon	13	09M
	Firſt quart.	20	06M
	Full moon	27	08 A
October	Laſt quart.	05	07 A
	New moon	12	06 A
	Firſt quart.	19	06 A
	Full moon	27	03 A
November	Laſt quart.	04	07M
	New moon	11	05M
	Firſt quart.	18	06M
	Full moon	26	10M
December	Laſt quart.	03	07A
	New moon	10	04A
	Firſt quart	18	02M
	Full moon	26	03M

The Year 1737 *hath four Eclipſes, two of the Sun, and two of the Moon.*

The firſt will be of the Sun, *Feb.* 18th viſible 11 Digits.
The ſecond will be of the Moon, *March* 5th, inviſible.
The third will be of the Sun, *Auguſt* 15th, Morning, inviſible.
The fourth will be of the Moon, *Aug.* 29th, Morning, viſible 5 digits

A Table of the Moon's Age for the year 1738

Months		D.	H.
January	Laſt quart	02	07M
	New moon	09	04M
	Firſt quart	16	09A
	Full moon	24	06A
	Laſt quart	31	05A
Febru.	New moon	07	06A
	Firſt quart	15	05A
	Full moon	23	08M
March	Laſt quart	02	03M
	New moon	09	10M
	Firſt quart	17	10M
	Full moon	24	05 A
	Laſt quart	31	01 A
April	New moon	07	09A
	Firſt quart	15	12A
	Full moon	23	01M
	Laſt quart.	29	11 A
May	New moon	07	05 A
	Firſt quart	15	11M
	Full moon	22	11M
	Laſt quart	29	10M
June	New moon	06	09M
	Firſt quart	13	09 A
	Full moon	20	05A
	Laſt quart	27	10A

Months		D.	H.
July	New moon	05	11 A
	Firſt quart	13	05M
	Full moon	20	01M
	Laſt quart	27	01 A
Auguſt	New moon	04	00 A
	Firſt quart	11	01 A
	Full moon	18	11M
	Laſt quart	26	06M
September	New moon	02	11 A
	Firſt quart	09	09 A
	Full moon	16	11 A
	Laſt quart	24	11 A
October	New moon	02	10M
	Firſt quart	09	06 M
	Full moon	16	02 A
	Laſt quart	24	03 A
	New moon	31	07 A
November	Firſt quart	07	05A
	Full moon	15	08M
	Laſt quart	23	07M
	New moon	30	07M
December	Firſt quart	07	08M
	Full moon	15	05M
	Laſt quart	22	08A
	New moon	29	06A

The Year 1738 *hath two Eclipſes, both Solar*

The firſt will be on *February* the 7th, inviſible.

The ſecond will be *Auguſt* 4th, viſible 4 Digits.

A Table of the Moon's Age for the year 1739.

Months		D.	H.
January	Firſt quart.	05	06 A
	Full moon	13	11 A
	Laſt quart.	21	01 A
	New moon	28	05 M
February	Firſt quart.	04	01 A
	Full moon	12	04 A
	Laſt quart.	19	10 A
	New moon	26	05 A
March	Firſt quart.	06	09 M
	Full moon	14	06 M
	Laſt quart.	21	05 M
	New moon	28	05 M
April	Firſt quart.	05	05 M
	Full moon	12	06 A
	Laſt quart.	19	11 M
	New moon	26	07 M
May	Firſt quart.	04	10 A
	Full moon	12	02 M
	Laſt quart.	18	07 A
	New moon	26	09 M
June	Firſt quart	03	01 A
	Full moon	10	09 M
	Laſt quart.	17	02 M
	New moon	24	12 A
July	Firſt quart	02	12 A
	Full moon	09	05 A
	Laſt quart.	16	00 N
	New moon	24	04 A
Auguſt	Firſt quart	01	09 M
	Full moon	07	12 A
	Laſt quart.	15	02 M
	New moon	23	07 M
	Firſt quart.	30	05 A
September	Full moon	06	09 M
	Laſt quart.	13	07 A
	New moon	21	09 A
	Firſt quart.	28	12 A
October	Full moon	05	08 A
	Laſt quart.	13	03 A
	New moon	21	10 A
	Firſt quart.	28	06 A
November	Full moon	04	10 M
	Laſt quart.	12	00 N
	New moon	19	10 M
	Firſt quart.	26	03 A
December	Full moon	04	04 M
	Laſt quart.	12	08 A
	New moon	19	09 M
	Firſt quart	26	02 M

The Year 1739 hath four Eclipſes, two of the Sun, and two of the Moon.

The firſt will be of the Moon, *Jan.* 13th viſible 8 Digits.
The ſecond will be of the Sun, *Jan.* 27th, inviſible.
The third will be of the Moon, *July* 9th, inviſible.
The fourth will be of the Sun, *July* 24th, viſible 7 digits.

The Uſe of the foregoing Table of the Moon's Age.

IN the ſaid Table the one half Page contains the firſt ſix Months of the Year, the other half the following ſix Months: in the firſt Column of each half, towards the Left-hand, are the Months, in the ſecond the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the ſaid New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A ſignifying Afternoon, M Morning. At the Bottom of the Tables are the Eclipſes for the reſpective Year.

The Uſe of this Table is, readily by Inſpection, to find the Day, Hour and Minute of the New, Full, or Quarters of the Moon.

Example 1. Suppoſe it were deſired to find the time of New-Moon, *Jan.* 1732: Firſt, look for the Year 1732 on the Top of the Leaf, which having found, look for *January* in the firſt Column towards the Left-hand; then in the next Column in the ſame Month is found New Moon; and in the two following Columns. againſt New Moon ſtands 15:12 M which ſhews that the New Moon in *January* 1732 is the 15th Day 12 Morning. The ſame Directions ſerve for the Full Moon, or firſt and laſt Quarters.

To find the *Moon*'s Age, ſubtract the Day of the Change or New Moon from the Day propoſed, the Remainder is the *Moon*'s Age. Suppoſe therefore it were required to find the *Moon*'s Age on *March* 27, 1732.

Looking in the Year 1732, the Table gives the New moon for *March* to be on the 15th Day, therefore 15 being ſubtracted from 27, there remains 12, whereby it appears the Moon is 12 Days old on the 27th of *March* in the Year 1732.

Example 2. Suppoſe it were required to find the Moon's Age on the 6th of *June*, 1732.

The laſt New Moon before *June* 6th, was *May* 13th; but becauſe you cannot take 13 from 6 you muſt add 31 (the Number of Days in *May*) and from the Sum 37, ſubtract 13, the Remainder 24 is the Moon's Age required.

A Tide Table for the Sea Coaſts of Great-Britain, Ireland, Norway, Holland, Flanders, France, Biſcay, *&c. Shewing what Moon makes Full Sea, upon the Full and Change Days, at the places following, in Alphabetical Order.*

A	H.	M		H.	M
AT *Army*, NNE and SSW	01	30	At *Abermorick*, and *Antwerp*, Eaſt and Weſt	06	00
At *Amſterdam* and *Armenties*, NE. and SW.	03	00	At *Alborough*, S. E by S, and N W by N	09	45
At *Abarwark*, E N E. and WSW	04	30	At		

	H	M
B		
At *Beachy* and *Blacktail*, and before the *Race* of *Blanquet* N and S	12	00
Thwart of *Beachy* in the *Offing* N by E and S by W	12	45
At *Blackneſs* in *Bluet*, at *Bell Iſle*, NNE and SSW	01	30
Without *Bluet*, and at *Berwick*, NE by N. and SW by S	02	15
The River of *Bourdeaux*, the South Coaſt of *Britaigne*, the Coaſt of *Biſcay* and at *Bloekneſs*, NE. and SW	03	00
At *Breſt*, before the *Baſs*, the River of *Bourdeaux* within the Haven, NE by E. and SW by W.	03	45
In the *Breeſound*, *Bloy*, *Baltimore*, ENE and WSW	04	30
Before *Bremen*, and at *Blackney*, and in the Channel before *Bourdeaux*, Eaſt and Weſt	06	00
At *Briſtol Key*, E by S. and W by N	06	45
At *Bridgwater*, ESE. and WNW	07	30
Bullen-deep, SSE and NNW	10	30
C		
In *Condado*, N. and S.	12	00
In the *Chamber* of *Rye* N by E. and S by W	12	45
Without *Calice*, at *Corpus Chriſti* Point, before and at *Camfer* NNE and SSW	01	30
Between *Calice* and *Dover*, before *Conquet*, and at the N. *Cape*, NE. and SW.	03	00
At *Cork*, *Calice*, *Cape Clear*, and in the *Creek*, ENE. and WSW	04	30
At *Caldy*, and in the Bay of *Carnarvan*, E by N. and W by S	05	15
At *Concalo*, Eaſt and Weſt	06	00
Without the *Caskets*, in the Channel SE by E. and NW. by W.	08	15
Between *Guernſey* and the *Caskets*, before *Cromer*, before the *Caskets*, at *Guernſey*, at *Seven Cliſts*, and at *Catneſs*, S.E and NW	09	00
At the *Caskets* and at *Chamberneſs* SE by S and NW by N	09	45
At *Cows*, in the *Foſs* of *Caen*, in *Calice Road*, and in *Chamberneſs-Road*, SSE and NNW.	10	30
Before the Haven of *Caen*, in the *Chamber*, between *Cripple ſand* and the *Creyl*, and at *Culbot*, S by E. and N by W	11	15
D		
At *Dover Peer*, and before *Dunkirk* North and South	12	00
At *Denbeigh* and *Downs* in the Road, NE by N. & SW by S.	02	15
At *Dort*, NE and SW	03	00
At *Dungervan*, ENE. and WSW	04	30
At *Dartmouth*, Eaſt and Weſt	06	00
At *Dublin*, SE by E. and NW by W	08	15
At *Dunbar*, SE. and NW.	09	00
At *Dungeneſs* and *Dunnoſe*, SE by S. and NW by N	09	45
At *Dover*, *Diep*, and in the *Downs* a ſhoar, SSE. and NNW	10	30
E		
At *Emden*, before the *Elve*, before the *Eyder*, and before *Enchuſun*, N and S	12	00
At *Edam*, NNE and SSW	01	30
Before the Eaſtern and Weſtern *Emes*, and *Engomonts*, SE and NW	09	00
F		
On the Coaſt of *Flanders*, North and South	12	00
At *Fluſhing*, N by E. and S by W	12	45

	H	M
Before the *Fen*, in the Channel NNE and S S W	01	30
Without *Fountney*, N E by N and SW by S	02	15
Without the Banks of *Flanders*, N E and S W	03	00
At *Flamborough* and *Bradlington*, ENE and WSW	04	30
At the *Forn*, in *Foy*, at *Falmouth*, E by N and W by S	05	15
Between *Foy* and *Falmouth*, in the Channel, and at *Foulneſs*, E by S and W by N	06	45
Before the Coaſt of *Frizeand* and the *Fly*, E S E. and WNW	07	30
Without the *Fly*, SE by E. and NW by W	08	15
At *Frize* and *Fair Iſle*, NW. and SE	09	00
At the *Frith*, and at the *South Foreland*, SSE and NNW	10	30
In *Fair Iſle Roads*, and at the *North Foreland*, South by Eaſt and North by Weſt	11	15
G		
In the Road of *Gibralter*, at *Graveling*, and before *Cherburg*, North and South	12	03
Before *Goeree*, at *Guernſey*, and at *Graveſend*, NNE and SSW	10	30
At *Groin*, at *Gaſcoign*, and the Coaſt of *Galicia*, North Eaſt and South Weſt	03	00
Between *Guernſey* and *Caskets* SE and NW	09	00
Thwart of *Guernſey* in the Channel, S. E by S. and N W by N.	09	45
In the *Chamber*, and *Goree-end*, S by by E and N by W	11	15
H		
Before the *Hever*, before *Horn*, and at *Hampton Key*, N. and S.	12	00
Under *Holy Iſland*, and at *Horn*, NNE and SSW	01	30
Before *Hartlepool*, N E. and SW	03	00
At *Huntcliff foot*, NE by E. and SW by W	03	45
At *Humber* E by N & W by S	05	15
Before *Hamborough*, at *Hull*, at the *Holms*, and before *Humber's Mouth*, Eaſt and Weſt	06	00
At *Harlem*, *Havre de Grace*, and *Homehead*, S E and N W	09	00
At St. *Helens*, at *Harwich*, and without the Banks of *Harwich* SSE and NNW	10	30
At *Harwich* within, S by E. and N by W	11	15
I		
At *Jutland* Iſlands N and S	12	00
On the Weſt Coaſt of *Ireland*, NE and SW	03	00
In all the Havens on the South Coaſt of *Ireland*, E. by N and W by S	05	30
K		
Kentiſh Knock, N and S	12	00
At *Keillers*, NE and SW	03	00
At *Kingſale* ENE & WSW	04	30
At *Kilduyn*, ESE and WNW	07	30
At *Kildrive*, SE and N W	09	00
L		
At *Leith*, N and S	12	00
At *Lisbon*, N E. by N. and S W by S	02	15
At *London*, NE and S W	03	00
Thwart of *Londey*, and before *Lin*, E by N and W. by S	05	15
At *Lin* half Tide, at *Londey*, Eaſt and Weſt	06	00
At *Lin*, E by S and W. by N	6	45

At

	H.	M
At the *Lizard* by the Land ESE and WNW	07	30
At *Lambay*, S E by E and NW by W	08	15
At *Leyſtaff*, and thwart of it without the Banks, S S by S. NW by N.	09	45
In *Leyſtaff* Road and at *Long ſand-head*, SSE and NNW	10	30
M		
Within the *Maes*, or *Maldon*, N by E. and S by W	12	45
Before the *Maes*, NNE and SSW	01	30
At the *Maes*, and before St. *Matthews* Point, NE by E. and S by W	03	45
In *Mouſehole*, at St. *Matthews*, and within *Mount's-bay*, ENE and WSW	04	30
In *Milford*, at *Moonleſs*, at St. *Maloes*, E by N and W by S	05	15
Between *Mouſehole*, and *Falmouth*, and in *Milford* Haven, ESE and WNW.	07	30
In St. *Magnes ſound*, and at *Magnes* Caſtle, S E. by E and N W by W	08	15
At the *Iſle of Man*, SE.&NW	09	00
Before *Margate*, S by E and N by W	11	15
N		
At *Newport*, half Tide N&S	12	00
At the West end of the *Nower*, N by E and S by W	12	45
Before the River of *Nantz*, NE and SW	03	00
At *Newcaſtle* E by N & W by S	05	15
Before St. *Nicholas*, Eaſt by South and Weſt by North	06	45
At the *Needles*, at the Iſle of *Wight*, SE by E. and NW by W	08	15
All the Coaſt of *Normandy* and *Picardy*, SSE and NNW	10	30

	H	M
Between the *Naze* and *Warhead* of *Lower*, S by E. & N by W	11	15
O		
At *Orkneſs*, NE and SW	0	00
At *Orkney*, SE and NW	09	00
At *Orfordneſs*, SE by S and NW by N	09	45
At *Orfordneſs*, without the Banks, and between *Orford* and *Orwell-Waves*, SSE and NNW	10	30
At *Orfordneſs*, within the Sands S by E. and N by W	11	15
P		
At *Portſmouth*, Half Tide, North and South	12	00
At the *Pens*, *Porthus*, and *Peiſtu*, NE and SW	03	00
On the Coaſt of *Portugal*, NE by E. and SW by W	03	45
In *Plymouth*, and before St. *Pauls*, E by N. and W by S	05	15
At St. *Pauls* in the Haven, Eaſt and Weſt	06	00
Before *Podeſſemek*, E by S. and W by N.	06	45
Thwart of *Plymouth*, ESE and WNW	07	20
At the *Race* of *Portland*, SE and NW	09	00
Q		
At *Quinborough*, N and S	12	00
R		
At *Rocheſter*, N by E & S by W	12	45
At *Ramkins*, NNE & SSW.	01	30
At *Rotterdam*, in *Robin-hoods* Bay, and from the Race to the *Pole-head*, NE and SW.	03	00
At *Rouen*, and before *Rochel*, NE by E and SW by W	03	45
In *Ramſey*, E by N & W by S	05	15
S		
In the *Sleve*, between *Uſhant* and *Scilly*, and *Shoes*, at the		

	H	M
Spits, at *Southampton*, and along the *Sum* North and South	12	00
Upon the Coaſt of *Spain*, and in *Shetland* N E and S W	03	00
At *Scilly*, in the *Sound*, *Scarburgh* & at *Staples* NE by E & SW by W	03	45
At *Seven Iſles*, without the Haven in the broad *Sound*, ENE and WSW	04	30
At the mouth of *Severn* between *Scilly* and the *Lizard*, at the *Spurn* & *Stockton*, E by N & W by S	05	15
Without *Scilly*, in the Channel, and at *Salcomb*. E and W	06	00
At *Sidmouth*, and at the *Start* E by S and W by N	06	45
Off the *Start* in the Channel, ESE and WNW	07	
Within the *Seyn*, and before *Shelbergh*, & at 7 *Clifts* SE & N W	09	00
At *Shoram*, SE *by* S & N W *by* N	09	45
At *Seyn head*. SSE & NNW	10	30
T		
Within *Tervere*, N by E. and S by W	12	45
Before *Tervere*, before the River of *Thames*, and at *Tinmouth* NNE and SSW	01	30
Before the *Tees* and *Tinmouth*, before the Bay of *Tinmouth*, N E and S W	03	00
At the *Clifts* of the *Texel*, E. NE. and WSW	04	30
In *Torbay*, and before the *Texel*, E and W	06	00
In the Road of the *Texel*, E SE and WNW	07	30
At *Torgon*, SE by S and N W by N	09	45
U		
Before *Urek*, N and S	12	00
At *Uſe*, N E and S W	03	00
Between *Uſhant*, and the Main, N E by E and S W by W	03	45
In the *Vourd*, at the Bay within *Uſhant*, ENE. and W S W	04	30
Without *Uſhant*, E and W	06	00
St. *Vallery*, S S E. and N. N W	10	30
W		
At *Whinchelſey*, N *by* E & S *by* W	12	45
At the *Weilings*, and from the W. end of the *Wight*, NNE & S S W	01	30
Before the *Weilings*, N E by N and SW by S	02	15
At *Whitby*, NE and SW	03	00
In the Sea of *Wales*, and *Severn*, ENE and WSW	04	30
In *Wales* E by N & W by S	05	15
At *Wells*, at *Weymouth*, and at *Waterford*, E. and W	06	00
At *Weymouth Key*, E by S and W by N.	06	45
At the *Neſs*, by *Wieringhen*, at *Winterton*, ESE and WNW	07	30
Thart of the Iſle of *Wight*, in the Channel, all within the Iſle of *Wight*, between the Iſle of *Wight* and *Beachy*, by the ſhore, SE by E and NW by W	08	15
At the E. end of the *Wight*, and on *Wieringhen* Flats, S E and NW	09	00
W		
Before *Yarmouth*, NNE, and SSW	01	30
At *Youghall*, E N E. and W SW	04	30
At *Yarmouth*, S E by E and N W by W	08	15
In *Yarmouth* Road, in *Yarmouth* Haven, SSE and NNW	10	30
Z		
On the Coaſt of *Zealand*, NNE and SSW	01	30
In the *Zierick-ſea*, NE & SW	03	00

The Uſe of the Tide-Table.

THE foregoing Table ſhews the Time of Full Sea at the ſeveral Places therein mentioned, upon the Full and Change Days of the Moon, which for more ready Uſe is put in Alphabetical Order.

Example. Admit the Time of Full Sea at *London*; upon the Full and Change Days required,

Look into the Table under the Letter (L) it is found to flow at *London* North Eaſt and South Weſt; that is when it is Full Sea at *London* upon the Full and Change Days of the Moon, the Moon will bear upon the North Eaſt and South Weſt points of the Compaſs, which, as the Compaſs ſhews, it is 3 Hours.

The Uſe of this, together with the Moon's Southing, to find the Time of Full Sea at any Time, at any of the ſaid Places, ſhall be ſhewn below.

To find the Moon's Southing.

To find the Southing of the Moon, multiply the Moon's Age by 4 and divide the Product by 5, and the Quotient is the Time of Southing in Hours, and the Remainder is ſo many 12 min. of an Hour.

Note, If the Moon's Age exceed 15, reject the ſaid 15, and take the Remainder, with which proceed inſtead of the Moon's Age.

Example. Suppoſe the time of the Moon's Southing be required on the 12th of *March* 1732. The Moon's Age will be found to be 27 days, rejecting 15, the Remainder is 12; which multiplied by 4, makes 48, which divided by 5, gives the Quotient 9 Hours 36 Minutes, which is the time of the Moon's Southing, which was required.

I ſhall here add a Table of the Moon's Southing to every Day of her Age.

Moon's Age.		Time H	M
01	16	00	48
02	17	01	36
03	18	02	24
04	19	03	12
05	20	04	00
06	21	04	48
07	22	05	36
08	23	06	24
09	24	07	12
10	25	08	00
11	26	08	48
12	27	09	36
13	28	10	24
14	29	11	12
15	30	12	00

The Uſe of the Table.

The firſt and ſecond Column ſhews the *Moon's* Age, the third the Southing.

Example.

The Moon being 9 Days old, and her Southing required

In the firſt Column under the Title *Moon's Age* ſtands 9; over againſt it in the laſt Column is 7 Hours 12 Minutes, the Time of the Southing required.

Note alſo, the ſame ſouthing ſerves for 24 Days old, as ſerves for 9 Days, as the Table ſhews.

Thus having got the Moon's Southing, procoed to find the Time of Full Sea, as follows,

Suppoſe the Moon being 9 Days old, the Time of Full-Sea in the *Downs* is required.

By the foregoing Table it appears that a NNW. and SSE. Moon makes Full Sea, which, as the ſaid Table ſhews, it 10 Hours 30 Minutes; to which addding the Moon's ſouthing at 9 Days old (*viz.* 7 Hours 12 Minutes,) it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes, rejecting 12 Hours in the Morning.

But to be more exact, uſe the following Table and Directions

Moon's Age.		Time H	M
01	16	00	43
02	16	01	20
03	17	01	52
04	18	02	22
05	19	02	52
06	20	03	26
07	21	04	07
08	22	04	55
09	23	05	50
10	24	06	53
11	25	07	59
12	26	09	04
13	27	10	08
14	29	11	05
15	30	00	00

Having found the Time of Full Sea, upon the Full and Change Days, by the preceeding Table for that Purpoſe, enter this Table with the Moon's Age; againſt which in the laſt Column are the Hours and Minutes to be added for the time of Full Sea deſired.

Example

Suppoſe as before, the Moon being 9 Days old, and the Time of Full Sea in the *Downs* is required.

A NNW. and SSE. Moon making Full Sea upon the Full and Change Days, which is 10 hours 30 min. which being found, enter this Table with the Moon's Age 9 Days, againſt which ſtands 5h. 50 min. which added to 10h. 30 min. makes 16 hours 20 minutes, or 4 hours 20 min. (rejecting 12 Hours) in the Morning.

Here follows,

A New and Exact KALENDAR

OF

The Sun's Place and Declination to every Day of the Year, for the Firſt, Second, Third, and Leap-Years, newly calculated and made to ſerve (without ſenſible Error) till the Year 1744. *Likewiſe the Sun's Riſing, whereby may be found the time of Setting, and Length of the Day and Night; together with the Southing of the Principal Fixed Stars at Midnight.*

A

A Table of the Dominical Letters, Cycle *of the* Sun, Prime, Epact, *and* Moveable Feaſts, *for* 18 *Years to come.*

Years.	Dom. Letter	Cycle ☉	Prime.	Epact	Shrove-Sunday.		Eaſter-Sunday		Whit-Sunday	
1730	D	3	2	22	*February*	8	*March*	29	*May*	17
1731	C	4	3	3		28	*April*	18	*June*	6
1732	B A	5	4	14		20		9	*May*	28
1733	G	6	5	25		7	*March*	25		13
1734	F	7	6	6		24	*April*	14	*June*	2
1735	E	8	7	17	*March*	6	*April*	16	*May*	25
1736	D C	9	8	28	*February*	27		7	*June*	13
1737	B	10	9	9		10		12	*May*	29
1738	A	11	10	20		12		2		21
1739	G	12	11	1		4		22	*June*	10
1740	F E	13	12	12	*February*	17	*April*	6	*May*	25
1741	D	14	13	23		8	*March*	29		17
1742	C	15	14	4		28	*April*	18	*June*	6
1743	B	16	15	15		13		3	*May*	22
1744	A G	17	16	26		5	*March*	25		13
1745	F	18	1	7	*February*	24	*April*	14	*Jnne*	2
1746	E	19	18	18		9	*March*	30	*May*	18
1747	D	20	19	29	*March*	1	*April*	19	*June*	7

Jan.

January hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of ſtars at Midnight	First 1729 1737	Year 1733 1741			Second 1730 1738	Year 1734 1742			Thid 1731 1739	Year 1735 1743			Leap 1732 1740	Year 1736 1744		
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♑		South		♑		South		♑		South		♑		South	
1	A	Circumciſion	22	22	21	37	22	07	21	40	21	52	21	42	21	38	21	44
2	B	*Sol.* r 8. 0	23	23	21	27	23	08	21	30	22	53	21	32	22	39	21	35
3	C		24	24	21	17	24	09	21	19	23	55	21	22	23	40	21	24
4	D		25	25	21	00	25	10	21	08	24	56	21	11	24	41	21	14
5	E		26	26	20	54	26	12	20	57	25	57	21	00	25	42	21	03
6	F	Epiphany	27	28	20	42	27	13	20	45	26	58	20	48	26	43	20	51
7	G		28	29	20	30	28	14	20	33	27	59	20	36	27	44	20	39
8	A		29	30	20	18	29	15	20	21	29	00	20	24	28	45	20	27
9	B	*Sol* in *Aqua*	♒	31	20	05	♒	16	20	08	♒	01	20	11	29	46	20	14
10	C		01	32	19	51	01	17	19	55	01	02	19	58	♒	47	20	01
11	D		02	33	19	38	02	28	19	41	02	03	19	44	01	48	19	48
12	E	*Sun* r 7. 44	03	34	19	24	03	19	19	27	03	04	19	30	02	49	19	34
13	F		04	35	19	09	04	20	19	13	04	05	19	16	03	50	19	20
14	G		05	36	18	54	05	21	18	58	05	06	19	02	04	51	19	05
15	A		06	37	18	39	06	22	18	43	06	07	18	47	05	52	18	50
16	B		07	38	18	24	07	23	18	28	07	08	18	31	06	53	18	35
17	C		08	38	18	08	08	24	18	12	08	09	18	16	07	54	18	10
18	D		09	39	17	51	09	25	17	56	09	10	18	00	08	55	18	04
19	E		10	40	17	36	10	25	17	40	10	11	17	44	09	56	17	38
20	F		11	41	17	19	11	26	17	23	11	12	17	27	10	57	17	31
21	G	*Sun* r 7. 30	12	42	17	02	12	27	17	06	12	12	17	10	11	5[illegible]	17	14
22	A		13	43	16	44	13	28	16	49	13	13	16	53	12	58	16	57
23	B		14	43	16	27	14	29	16	31	14	14	16	35	13	59	16	40
24	C		15	44	16	09	15	30	16	13	15	15	16	18	15	00	16	22
25	D	Conv. St. *Paul*	16	45	15	51	16	30	15	55	16	16	16	00	16	01	16	04
26	E		17	46	15	32	17	31	15	36	17	16	15	41	17	02	15	46
27	F		18	46	15	14	18	31	15	18	18	17	15	23	18	02	15	27
28	G		19	47	14	55	19	32	14	59	19	18	15	04	19	03	15	08
29	A		20	48	14	35	20	33	14	40	20	18	14	45	20	04	14	49
30	B	K. *Charles* B.	21	48	14	16	21	34	14	21	21	19	14	25	21	04	14	30
31	C		22	49	13	56	22	34	14	01	22	20	14	06	22	05	14	11

February hath XXVIII Days.

Month Days	Week Days	Remarkable days, and ſouthing of ſtars at midnight	Firſt		Year		Second		Year		Third		Year		Leap		Year	
			1729 737		1733 174		1730 1738		1734 1742		1731 1739		1735 1743		1732 1740		1736 1744	
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♒		South		♒		South		♒		South		♒		South	
1	D	Purif. *Mary*	23	50	13	36	23	35	13	41	23	20	13	46	23	05	13	51
2	E	Lion's Heart	24	50	13	16	24	35	13	21	24	21	13	26	24	06	13	3[illegible]
3	F		25	51	12	56	25	36	13	01	25	21	13	06	25	07	13	11
4	G		26	51	12	35	26	37	12	40	26	22	12	45	26	07	12	50
5	A	Lyon's Neck	27	52	12	14	27	37	12	19	27	22	12	24	27	08	12	29
6	B	Sun r. 7 1.	28	52	11	53	28	37	11	58	28	23	12	04	28	08	12	09
7	C	*Sol* in *Piſces*	29	53	11	32	29	38	11	37	29	23	11	42	29	09	11	48
8	D		♓	53	11	11	♓	38	11	16	♓	24	11	21	♓	09	11	26
9	E		01	53	10	49	01	39	10	55	01	24	11	00	01	09	11	05
10	F		02	54	10	28	02	39	10	33	02	24	10	38	02	10	10	43
11	G		03	54	10	06	03	39	10	11	03	25	10	16	03	10	10	22
12	A		04	54	09	44	04	40	09	49	04	25	09	54	04	10	10	00
13	B	*Valentine*	05	55	09	22	05	40	09	27	05	25	09	32	05	11	09	38
14	C	Sun r. 6. 45.	06	55	08	59	06	40	09	05	06	26	09	10	06	11	09	16
15	D	Lower of the	07	55	08	37	07	40	08	42	07	26	08	48	07	11	08	53
16	E	two foremoſt	08	55	08	14	08	40	08	20	08	26	08	25	08	11	08	31
17	F	in □ of grea Bear.	09	55	07	52	09	41	07	57	09	26	08	03	09	11	08	58
18	G		10	55	07	29	10	41	07	35	10	26	07	40	10	12	07	46
19	A		11	55	07	06	11	41	06	12	11	26	07	17	11	12	07	23
20	B		12	55	06	43	12	41	06	49	12	26	06	54	12	12	07	00
21	C		13	55	06	20	13	41	06	26	13	26	06	31	13	12	06	37
22	D	Sun r. 6 29.	14	55	05	57	14	41	06	03	14	26	06	08	14	12	06	14
23	E	St· *Matthias*	15	55	05	34	15	41	05	39	15	26	05	45	15	12	05	51
24	F		16	55	05	10	16	41	05	16	16	26	05	22	16	12	05	27
25	G		17	55	04	47	17	41	04	53	17	26	04	58	17	12	05	04
26	A		18	55	04	24	18	40	04	29	18	26	04	35	18	11	04	41
27	B		19	55	04	00	19	40	04	06	19	26	04	12	19	11	04	17
28	C		20	55	03	37	20	40	03	42	20	26	03	48	20	11	03	54
29	D														21	11	03	30

When it is Leap-year *February* hath 29 Days

March hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of ſtars at midnight	First Year 1729 1737		1733 1741		Second Year 1730 1738		1734 1742		Third Year 1731 1739		1735 1743		Leap Year 1732 1740		1736 1744	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♓		South		♓		South		♓		South		♓		South	
1	D	David	21	54	03	13	21	40	03	19	21	25	03	24	22	11	03	07
2	E	Lion's Tail	22	54	02	49	22	40	02	55	22	25	03	01	23	10	02	43
3	F	Lower of two	23	54	02	26	23	39	02	31	23	25	02	37	24	10	02	19
4	G	latter in □ of Great Bear	24	53	02	02	24	39	02	08	24	24	02	14	25	10	01	56
5	A		25	53	01	38	25	39	01	44	25	24	01	50	26	09	01	32
6	B		26	53	01	15	26	38	01	20	26	24	01	26	27	09	01	08
7	C		27	52	00	51	27	38	00	57	27	23	01	02	28	08	00	45
8	D		28	52	00	27	28	37	00	33	28	23	00	39	29	08	00	21
9	E	Sun r. 6. 0.	29	51	00	04	29	37	00	09	29	22	00	15	♈	07	Nor.	03
10	F		♈	50	Nor.	20	♈	36	Nor.	14	♈	22	Nor.	09	01	07	00	27
11	G	Upper of two	01	50	00	44	01	36	00	38	01	21	00	32	02	06	00	50
12	A	latter in □ of Great Bear	02	49	01	07	02	35	01	02	02	20	00	56	03	05	01	14
13	B		03	49	01	31	03	34	01	25	03	20	01	20	04	05	01	37
14	C		04	48	01	55	04	34	01	49	04	19	01	43	05	04	02	01
15	D		05	47	02	18	05	32	02	12	05	18	02	07	06	03	02	25
16	E		06	46	02	42	06	32	02	36	06	18	02	30	07	03	02	48
17	F	Sun r. 5. 44	07	46	03	05	08	31	02	59	07	17	03	54	08	02	03	11
18	G		08	45	03	28	08	30	03	23	08	16	03	17	09	01	03	35
19	A		09	44	03	52	09	30	03	46	09	15	03	40	10	00	03	58
20	B		10	43	04	15	10	29	04	09	10	14	04	04	10	59	04	21
21	C	Laſt but two	11	42	04	38	11	28	04	33	11	13	04	27	11	58	04	44
22	D	in Great	12	41	05	01	12	27	04	56	12	12	04	50	12	57	05	07
23	E	Bears Tail	13	40	05	24	13	26	05	19	13	11	05	13	13	56	05	30
24	F	Sun r. 5 30.	14	39	05	47	14	25	05	42	14	10	05	36	14	55	05	53
25	G	Lady-day.	15	38	06	10	15	24	06	04	15	09	05	59	15	54	06	16
26	A		16	37	06	33	16	23	06	27	16	08	06	22	16	53	06	39
27	B		17	36	06	55	17	21	06	50	17	07	06	44	17	52	07	01
28	C	*Virgins Spike*	18	34	07	18	18	20	07	12	18	06	07	07	18	5	07	24
29	D	Laſt but one	19	33	07	40	19	19	07	34	19	05	07	39	19	49	07	46
30	E	in Great	20	32	08	02	20	18	07	57	20	04	07	51	20	48	08	08
31	F	Bears Tail.	21	31	08	24	21	17	08	19	21	02	08	13	21	47	08	30

Month Days	Week Days	Remarkable days, and fouthing of ſtars at Midnight	First			Year	Second			Year	Thid			Year	Leap			Year
			1729			1733	1730			1734	1731			1735	1732			1736
			1737			1741	1738			1742	1739			1743	1740			1744
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♈		North		♈		North		♈		North		♈		North	
1	G	*Sun* r 5 16.	22	29	09	46	22	15	08	41	22	01	08	35	22	45	08	52
2	A		23	28	09	08	23	14	09	03	23	00	08	57	23	44	09	14
3	B		24	27	09	29	24	12	09	24	23	58	09	19	24	43	09	35
4	C	Laſt in Great *Bears Tail.*	25	25	09	51	25	11	09	46	24	57	09	41	25	41	09	57
5	D		26	24	10	12	26	10	10	07	25	55	10	02	26	40	10	18
6	E	Sun r 5. 6	27	22	10	33	27	08	10	28	26	54	10	23	27	38	10	39
7	F		28	21	10	54	28	07	10	49	27	53	10	44	28	37	11	00
8	G		29	19	11	15	29	05	11	10	28	51	11	05	29	35	11	21
9	A		♉	18	11	36	♉	04	11	31	29	49	11	26	♉	34	11	41
10	B		01	16	11	56	01	02	11	51	♉	48	11	46	01	32	12	02
11	C	*Dragons Tail*	02	15	12	16	02	00	12	12	01	46	12	07	02	30	12	22
12	D	*Arcturus*	03	13	12	36	02	59	12	32	02	45	12	27	03	29	12	42
13	E		04	11	12	56	03	57	12	52	03	43	12	47	04	27	13	02
14	F		05	09	13	16	04	55	13	11	04	41	13	06	05	25	13	21
15	G		06	08	13	35	05	54	13	31	05	39	13	26	06	24	13	41
16	A	*Sun* r 4. 48	07	06	13	54	06	52	13	50	06	38	13	45	07	22	14	00
17	B		08	04	14	13	07	50	14	09	07	36	14	04	08	20	14	19
18	C		09	02	14	32	08	48	14	28	08	34	14	23	09	18	14	37
19	D		10	00	14	51	09	46	14	46	09	32	14	42	10	16	14	56
20	E	Southermoſt Scale of *Libra*	10	58	15	09	10	44	15	04	10	30	15	00	11	14	15	14
21	F		11	57	15	27	11	42	15	22	11	28	15	18	12	12	15	32
22	G	*Sun* r. 4 37	12	55	15	45	12	41	15	40	12	26	15	36	13	10	15	49
23	A	*St.* George	13	53	16	02	13	39	15	58	13	24	15	54	14	08	16	07
24	B		14	51	16	19	14	37	16	15	14	22	16	11	15	06	16	24
25	C	St. *Mark Ev.*	15	49	16	36	15	35	16	32	15	20	16	28	16	04	16	41
26	D	Upper of two	16	46	16	53	16	32	16	49	16	18	16	45	17	02	16	57
27	E	foremoſt in □	17	44	17	09	17	30	17	05	17	16	17	01	18	00	17	14
28	F	of *Little Bear*	18	42	17	25	18	28	17	21	18	14	17	15	18	58	17	30
29	G		19	40	17	41	19	26	17	37	19	12	17	33	19	56	17	45
30	A	N Scale of ♎	20	38	17	57	20	24	17	53	20	10	17	49	20	54	18	01

May hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of ſtars at Midnight	First Year 1729 1733 1737 1741				Second Year 1730 1734 1738 1742				Third Year 1731 1735 1739 1743				Leap Year 1732 1736 1740 1744			
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♉		North		♉		North		♉		North		♉		North	
1	B	Phil and Jac.	21	36	18	12	21	22	18	08	21	08	18	04	21	52	18	16
2	C	*Sun* r. 4. 21	22	34	18	27	22	20	18	23	22	06	18	19	22	46	18	31
3	D	Brighteſt in	23	31	18	41	23	17	18	38	23	03	18	34	23	47	18	45
4	E	the Crown	24	29	18	56	24	15	18	52	24	01	18	49	24	45	18	59
5	F	Brighteſt in	25	27	19	17	25	13	19	06	24	59	19	03	25	43	19	13
6	G	Serpents neck	26	24	19	23	26	10	19	20	25	57	19	17	26	40	19	27
7	A		27	22	19	36	27	08	19	33	26	55	19	30	27	38	19	40
8	B		28	20	19	40	28	06	19	46	27	54	19	43	28	36	19	53
9	C	Scorpions	29	17	20	02	29	03	19	59	28	50	19	56	29	33	20	06
10	D	Forehead	♊	15	20	14	♊	01	20	11	29	47	20	09	♊	31	20	18
11	E	*Sun* r 4. 8	01	13	20	26	00	59	20	24	♊	45	20	21	01	28	20	30
12	F		02	10	20	38	01	56	20	35	01	42	20	32	02	29	20	41
13	G		03	08	20	49	02	54	20	47	02	40	20	14	03	23	20	52
14	A	Scorpions	04	05	21	00	03	51	20	58	03	37	20	55	04	21	21	03
15	B	Heart.	05	02	21	11	04	49	21	08	04	35	21	06	05	18	21	14
16	C		06	00	21	21	05	46	21	18	05	32	21	16	06	16	21	24
17	D		06	59	21	31	06	44	21	28	06	30	21	26	07	13	21	33
18	E		07	56	21	40	07	42	21	38	07	27	21	36	08	11	21	43
19	F		08	53	21	49	08	39	21	47	08	25	21	45	09	01	21	52
20	G	Sun r. 3 57	09	50	21	58	09	36	21	56	09	22	21	54	10	06	22	00
21	A		10	47	22	06	10	33	22	04	10	20	22	02	11	03	22	08
22	B		11	45	22	14	11	31	22	12	11	17	22	10	12	01	22	16
23	C		12	42	22	22	12	29	22	20	12	14	22	18	12	58	22	24
24	D		13	40	22	29	13	26	22	27	13	12	22	25	13	56	22	31
25	E		14	37	22	36	14	23	22	34	14	09	22	32	14	54	22	37
26	F		15	34	22	42	15	20	22	41	15	07	22	39	15	50	22	44
27	G	*Sun* r. 3 53	16	32	22	48	16	18	22	47	16	04	22	45	16	47	22	50
28	A		17	29	22	54	17	16	22	52	17	01	22	51	17	45	22	55
29	B	K C. 2 B &R.	18	16	22	59	18	13	22	58	17	58	22	51	18	42	23	00
30	C		19	23	23	04	19	10	22	02	18	56	23	02	19	39	23	05
31	D		20	20	23	08	20	07	22	07	19	53	23	06	20	36	23	09

12·00
3 53
06 07

June hath XXX Days

Month Days	Week Days	Remarkable days, and ſouthing ot ſtars at midnight.	First			Year	Second			Year	Third			Year	Leap			Year
			17·9			1733	1730			1734	1731			1735	173·			1736
			1737			1741	1738			1742	1739			174·	1740			1744
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			II		North		II		North		II		North		II		North	
	E		21	18	23	12	21	04	23	11	20	50	23	10	21	34	23	13
2	F	Sun r. 3. 50.	22	15	23	15	22	01	23	14	21	48	23	14	22	31	23	16
3	G		23	12	23	19	22	59	23	18	22	45	23	17	23	28	23	19
4	A		24	10	23	21	23	56	23	21	23	42	23	20	24	25	23	22
5	B		25	07	23	24	24	53	23	23	24	39	23	23	25	23	23	24
6	C		26	04	23	25	25	50	23	25	25	37	23	25	26	20	23	26
7	D		27	01	23	27	26	48	23	27	26	34	23	26	27	17	23	2
8	E		27	59	23	28	27	45	23	28	27	31	23	28	28	14	23	28
9	F		28	56	23	29	28	42	23	29	28	28	23	28	29	19	23	29
10	G		29	53	23	29	29	39	23	29	29	25	23	29	♋	09	23	29
11	A	Sun r. 3. 47.	♋	50	23	29	♋	36	23	29	♋	23	23	29	01	06	23	29
12	B		01	47	23	28	01	34	23	28	01	20	23	29	02	03	23	28
13	C		02	45	23	27	02	31	23	28	02	17	23	28	03	00	23	27
14	D		03	42	23	26	03	28	23	26	03	14	23	27	03	58	23	25
15	E		04	39	23	24	04	25	23	25	04	11	23	25	04	55	23	24
16	F		05	36	23	22	05	22	23	22	05	09	23	23	05	52	23	21
17	G		06	33	23	19	06	20	23	20	06	06	23	21	06	40	23	18
18	A	Brighteſt in	07	31	23	16	07	17	23	17	07	03	23	18	07	46	23	15
19	B	the Harp	08	28	23	13	08	14	23	14	08	00	23	14	08	44	23	12
20	C		09	25	23	09	09	11	23	10	08	57	23	11	09	41	23	08
21	D	Sun r. 3. 50.	10	22	23	05	10	08	23	06	09	54	23	07	10	38	23	03
22	E		11	19	23	00	11	05	23	01	10	52	23	02	11	35	22	59
23	F		12	16	2	55	12	03	22	56	11	49	22	57	12	32	22	5[illegible]
24	G	John Baptiſt	13	14	22	49	13	00	22	51	12	46	22	52	13	29	22	48
25	A		14	21	22	44	13	58	22	4[illegible]	13	43	22	47	14	27	22	41
26	B		15	08	22	37	14	54	22	39	14	40	22	40	15	24	22	36
27	C		16	05	22	31	15	51	22	32	15	38	22	34	16	21	22	29
28	D		17	02	22	24	16	49	22	25	16	35	22	27	17	18	22	22
29	E	Peter Apoſtle	18	00	22	16	17	46	22	18	17	32	22	20	18	15	22	14
30	F		18	57	22	08	18	43	22	10	18	29	22	12	19	13	22	06

3 50

July hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of ſtars at midnight	Firſt 1729 1737 ☉ pla		Year 1733 1741 ☉ dec		Second 1730 1738 ☉ pla		Year 1734 1742 ☉ dec		Third 1731 1739 ☉ pla		Year 1735 1743 ☉ dec		Leap 1732 1740 ☉ pla		Year 1736 1744 ☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♋		North		♋		North		♋		North		♋		North	
1	G	Sun r. 3. 57	19	54	22	00	19	40	22	02	19	26	22	04	20	10	21	58
2	A		20	51	21	52	20	37	21	54	20	24	21	56	21	07	21	49
3	B		21	48	21	43	21	35	21	45	21	12	21	47	22	04	21	40
4	C		22	46	21	33	22	32	21	36	22	18	21	38	23	02	21	31
5	D	Brighteſt be-	23	43	21	24	23	29	21	26	23	15	21	29	23	59	21	21
6	E	tween the	24	40	21	14	24	26	21	10	24	13	21	19	24	56	21	11
7	F	Eagles ſhould	25	37	21	03	25	24	21	06	25	10	21	08	25	53	21	00
8	G		26	35	20	53	26	21	20	55	26	07	20	58	26	50	21	50
9	A		27	32	20	42	27	18	20	44	27	04	20	47	27	48	20	38
10	B		28	29	20	30	28	15	20	33	28	02	20	36	28	45	20	27
11	C	Sun r. 4. 8.	29	27	20	18	29	13	20	21	28	59	20	24	29	42	20	13
12	D		♌	24	20	06	♌	10	20	09	29	56	20	12	♌	40	20	03
13	E		01	21	19	54	01	07	19	57	♌	54	20	00	01	37	19	50
14	F		02	19	19	41	02	05	19	44	01	51	19	47	02	34	19	37
15	G		03	16	19	28	03	02	19	31	02	48	19	34	03	32	19	24
16	A	Sun r. 4. 16	04	13	19	14	03	59	19	18	03	46	19	21	04	29	19	10
17	B		05	11	19	00	04	57	19	04	04	43	19	07	05	27	18	57
18	C	Swan's Tail	06	08	18	46	05	54	18	50	05	40	18	53	06	24	18	41
19	D	Dog days beg	07	06	18	32	06	52	18	35	06	38	18	39	07	21	18	28
20	E		08	03	18	17	07	49	18	21	07	35	18	24	08	19	18	13
21	F	Sun r. 4. 23	09	00	18	02	08	47	18	06	08	33	18	10	09	16	17	58
22	G		09	58	17	47	09	44	17	51	09	30	17	54	10	14	17	43
23	A		10	55	17	31	10	42	17	35	10	28	17	39	11	12	17	27
24	B		11	53	17	15	11	49	17	19	11	25	17	23	12	09	17	11
25	C	James Apoſtle	12	50	16	59	12	37	17	02	12	23	17	07	13	06	16	55
26	D	Sun r. 4 30.	13	48	16	43	13	34	16	47	13	20	16	51	14	04	16	38
27	E		14	46	16	26	14	32	16	30	14	18	16	34	15	01	16	22
28	F		15	43	16	09	15	29	16	13	15	15	16	17	15	59	16	05
29	G		16	41	15	52	16	27	15	56	16	13	16	00	16	56	15	47
30	A		17	38	15	39	17	24	15	39	17	10	15	43	17	54	15	30
31	B		18	36	15	17	18	22	15	21	18	08	15	25	18	52	15	12

Auguſt hath XXXI Days

Month Days	Week Days	Remarkable days, and ſouthing of ſtars at midnight.	Firſt		Year		Second		Year		Third		Year		Leap		Year	
			1729		1733		1730		1734		1731		1735		1732		1736	
			1737		1741		1738		1742		1739		1743		1740		1744	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♌		North		♌		North		♌		North		♌		North	
1	C	Lammas	19	30	14	59	19	20	15	03	19	00	15	07	19	49	14	54
2	D		20	31	14	41	20	17	14	4	20	03	14	49	20	47	14	36
3	E		21	29	14	22	21	15	14	27	21	01	14	31	21	45	14	1
4	F		22	27	14	03	22	13	4	08	21	59	14	12	22	43	13	58
5	G		23	25	13	44	23	11	13	49	22	57	13	54	23	40	13	35
6	A		24	22	13	25	24	08	13	30	23	55	13	30	24	38	13	20
7	B	Sun r. 4. 50	25	20	13	06	25	06	13	11	24	52	13	15	25	36	13	01
8	C		76	18	12	46	26	04	12	51	25	50	12	56	26	34	12	41
9	D		27	16	12	27	27	02	12	31	26	48	12	36	27	32	12	21
10	E		28	14	12	07	28	00	12	12	27	46	12	16	28	29	12	01
11	F		29	12	11	47	28	58	11	51	28	43	11	56	29	27	11	41
12	G	*Sol* in *Virgo*	♍	09	11	26	29	55	11	31	29	41	11	36	♍	25	11	21
13	A		01	07	11	06	♍	53	11	12	♍	39	11	16	01	23	11	00
14	B		02	05	10	45	01	51	10	50	01	37	10	55	02	21	10	39
15	C		03	03	10	24	02	49	10	29	02	35	10	34	03	19	10	18
16	D	Sun r. 5. 8.	04	01	10	03	03	47	10	08	03	33	10	13	04	17	09	57
17	E		04	59	09	42	04	45	09	47	04	31	09	52	05	15	09	36
18	F		05	58	09	21	05	44	09	26	05	29	09	31	06	13	09	15
19	G		06	56	08	59	06	42	09	04	06	28	09	09	07	12	08	53
20	A		07	54	08	37	07	40	08	43	07	26	08	48	08	10	08	31
21	B	Fomelhaut	08	52	08	16	08	38	08	21	08	24	08	26	09	08	08	10
22	C	Sun r. 5. 19.	09	50	07	54	09	36	07	59	09	22	08	04	10	06	07	48
23	D		10	48	07	32	10	34	07	37	10	20	07	42	11	04	07	26
24	E	Barthol Ap.	11	47	07	09	11	32	07	15	11	18	07	20	12	03	07	03
25	F	Firſt in *Pegaſus* Wing	12	45	06	47	12	30	06	53	12	17	06	58	13	02	06	41
26	G		13	43	06	25	13	29	06	30	13	15	06	36	13	59	06	19
27	A	Sun r. 5. 29	14	42	06	02	14	28	06	08	14	13	06	16	14	58	05	56
28	B	Dog days end	15	40	05	40	15	26	05	45	15	12	05	51	15	56	05	33
29	C	Dec. I. B.	16	38	05	17	16	24	05	22	16	10	05	28	16	54	05	11
30	D		17	37	04	54	17	23	05	00	17	09	05	05	17	53	04	48
31	E		18	36	04	38	18	21	04	37	18	07	04	42	18	51	04	25

September hath XXX Days.

Month Days	Week Days	Remarkable days, and ſouthing of ſtars at midnight.	First Year 1729 1737				Second Year 1730 1738				Third Year 1731 1739				Leap Year 17 2 1740			
			1733 1741				1734 1742				1735 1743				1736 1744			
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♍		North		♍		North		♍		North		♍		North	
1	F	Sun r. 5. 38	19	34	04	08	19	20	04	14	19	06	04	19	19	50	04	02
2	G	*Lond.* burnt 66	20	32	03	45	20	18	03	51	20	04	03	50	20	48	03	39
3	A		21	31	03	22	21	17	03	28	21	03	03	32	21	47	03	16
4	B		22	30	02	59	22	15	03	05	22	02	03	10	22	46	02	5[illegible]
5	C		23	28	02	36	23	14	02	41	23	00	02	47	23	45	02	29
6	D		24	27	02	13	24	13	02	18	23	59	02	24	24	43	02	06
7	E		25	26	01	49	25	11	01	55	24	57	02	01	25	42	01	43
8	F		26	24	01	26	26	10	01	32	25	56	01	37	26	40	01	19
9	G		27	24	01	02	27	09	01	08	26	55	01	14	27	39	00	56
10	A		28	22	00	39	28	08	00	45	27	53	00	50	28	38	00	33
11	B	*Androm.* Head	29	21	00	16	29	07	00	21	28	52	00	27	29	37	00	09
12	C	Sun r. 6. 0.	♎	20	Sou.	08	♎	05	Sou,	02	29	51	00	04	♎	35	Sou.	14
13	D		01	19	00	31	01	04	00	26	♎	50	Sou,	20	01	35	00	38
14	E		02	18	00	55	02	03	00	45	01	49	00	42	02	34	01	01
15	F	End of Pegaſus Wing	03	17	01	18	03	02	01	13	02	48	01	07	03	33	01	25
16	G		04	16	01	42	04	01	01	36	03	47	01	35	04	32	01	48
17	A		05	15	02	05	05	00	02	00	04	46	01	54	05	31	02	12
18	B		06	14	02	29	05	59	02	23	05	45	02	17	06	30	02	35
19	C		07	13	02	52	06	58	02	46	06	44	02	41	07	29	02	58
20	D	Sun r. 6. 16	08	12	03	15	07	58	03	10	07	43	03	04	08	28	03	22
21	E	Matthew Ev.	09	11	03	39	08	57	03	33	08	42	03	28	09	27	03	45
22	F		10	10	04	02	09	56	03	56	09	42	03	51	10	26	04	08
23	G	Pole Star	11	10	04	25	10	55	04	20	10	41	04	14	11	26	04	32
24	A		12	09	04	49	11	54	04	43	11	40	04	37	12	25	04	55
25	b	Southermoſt in *Andromeda*'s Girdle	13	08	05	12	12	54	05	06	12	39	05	01	13	24	05	18
26	C		14	08	05	35	13	53	05	29	13	39	05	24	14	24	05	41
27	D		15	07	05	58	14	52	05	52	14	38	05	47	15	23	06	04
28	E		16	06	06	21	15	52	06	15	15	38	06	10	16	23	06	27
29	F	Sun r. 6 30.	17	06	06	44	16	51	06	38	16	37	06	33	17	22	06	50
30	G		18	05	07	06	17	51	07	01	17	36	06	55	18	21	07	13

Month Days	Week Days	Remarkable days, and ſouthing of ſtars at midnight	First		Year		Second		Year		Third		Year		Leap		Year	
			1729 1737		1733 1741		1730 1738		1734 1742		1731 1739		1735 1743		17 2 1740		1736 1744	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♎		South		♎		South		♎		South		♎		South	
1	A	Sun r. 6 38	19	05	07	29	18	50	07	23	18	36	07	18	19	20	07	35
2	B		20	04	07	52	19	50	07	46	19	35	07	41	20	2	07	58
3	C		21	04	08	14	20	49	08	08	20	35	08	03	21	20	08	2
4	D		22	04	08	37	21	49	08	31	21	35	08	26	22	20	08	43
5	E		23	03	08	59	22	49	08	5	22	34	08	48	23	20	09	05
6	F		24	03	09	21	23	48	09	15	23	34	09	10	24	19	09	27
7	G		25	03	09	43	24	48	9	37	24	34	09	32	25	19	09	49
8	A		26	02	10	04	25	48	09	59	25	33	09	54	26	19	10	10
9	B		27	02	10	6	26	48	10	21	26	33	10	16	27	19	10	32
10	C	*Andromeda's*	28	02	10	48	27	48	10	43	27	33	10	37	28	18	10	54
11	D	ſouthermoſt	29	02	11	09	28	47	11	04	28	33	10	59	29	18	11	15
12	E	Foot.	♐	02	11	30	29	47	11	25	29	33	11	20	♏	18	11	36
13	F	Sun r. 7. 4	01	02	11	51	♏	47	11	46	♏	33	11	41	01	18	11	57
14	G		02	02	12	12	01	47	12	07	01	33	12	02	02	18	12	18
15	A		03	02	12	33	02	47	12	28	02	33	12	23	03	18	12	38
16	B		04	02	12	53	03	47	12	48	03	33	12	43	04	18	12	59
17	C		05	02	1313		04	47	13	09	04	33	13	04	05	18	13	19
18	D	*Luke* Evan.	06	02	133	3	05	47	13	28	05	33	13	24	06	18	13	39
19	E		07	02	13	53	06	47	13	48	06	33	13	44	07	18	13	59
20	F		08	02	14	13	07	48	14	08	07	33	14	03	08	19	14	18
21	G		09	02	14	32	08	48	14	27	08	33	14	23	09	19	14	37
22	A		10	03	14	52	09	48	14	47	09	33	14	42	10	19	14	56
23	B		11	03	15	10	10	48	15	06	10	34	15	01	11	19	15	15
24	C		12	03	15	29	11	48	15	24	11	34	15	20	12	19	15	34
25	D	Sun r. 7. 24	13	03	15	47	12	49	15	43	12	34	15	38	13	20	15	52
26	E		14	04	16	05	13	49	16	01	13	34	15	57	14	20	16	10
27	F		15	04	16	23	14	49	16	19	14	35	16	15	15	20	16	28
28	G	*Simon*& *Jude*	16	04	16	41	15	50	16	37	15	35	16	32	16	21	16	45
29	A		17	05	16	58	16	50	16	54	16	36	16	50	17	21	17	03
30	B		18	05	17	15	17	51	17	11	17	36	17	07	18	22	17	20
31	C	Sun r. 7. 33	19	06	17	32	18	51	17	28	18	36	17	24	19	22	17	36

November hath XXX Days.

Month Days	Week Days	Remarkable days, and ſouthing of ſtars at midnight	First		Year		Second		Year		Third		Year		Leap		Year	
			1729 1737		1733 1741		1730 1738		1734 1742		1731 1739		1735 1743		1732 1740		1736 1744	
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♏		South		♏		South		♏		South		♏		South	
1	D	All Saints	20	06	17	48	19	52	17	44	19	37	17	40	20	23	17	53
2	E	Sun r. 7. 36	21	07	18	04	20	52	18	00	20	37	17	56	21	23	18	08
3	F		22	07	18	20	21	53	18	16	21	38	18	12	22	24	18	24
4	G	K. *W*. Nat.	23	08	18	35	22	53	18	32	22	38	18	28	23	24	18	40
5	A	Powder Plot	24	08	18	51	23	54	18	47	23	39	18	43	24	25	18	55
6	B		25	09	19	05	24	54	19	02	24	40	18	58	25	26	19	09
7	C		26	10	19	20	25	55	19	16	25	40	19	13	26	26	19	24
8	D		27	10	19	34	26	56	19	30	26	41	19	27	27	27	19	38
9	E		28	11	19	48	27	56	19	44	27	42	19	41	28	28	19	51
10	F		29	12	20	01	28	57	19	58	28	42	19	54	29	28	20	05
11	G	*Martin* B.	♐	13	20	14	29	58	20	11	29	43	20	08	♐	29	20	17
12	A		01	13	20	27	♐	59	20	24	♐	44	20	20	01	30	20	30
13	B	Sun r. 7. 53	02	14	20	39	01	59	20	36	01	45	20	33	02	31	20	42
14	C		03	15	20	51	03	00	20	48	02	45	20	45	03	31	20	54
15	D		04	16	21	02	04	01	20	59	03	46	20	57	04	32	21	05
16	E	*Aldebaran*	05	17	21	13	05	02	21	11	04	47	21	08	05	33	21	16
17	F		06	17	21	24	06	03	21	21	05	48	21	19	06	34	21	27
18	G		07	18	21	34	07	04	21	32	06	49	21	29	07	35	21	37
19	A		08	19	21	44	08	04	21	42	07	50	21	39	08	36	21	47
20	B		09	20	21	53	09	05	21	51	08	51	21	49	09	37	21	56
21	C		10	21	22	03	10	06	22	00	09	52	21	58	10	38	22	05
22	D		11	22	22	11	11	07	22	09	10	52	22	07	11	39	22	13
23	E		12	23	22	19	12	08	22	17	11	53	22	15	12	40	22	21
24	F	Sun r. 8. 5	13	24	22	27	13	09	22	25	12	54	22	23	13	41	22	29
25	G	*Capella*, or	14	25	22	34	14	10	22	33	13	55	22	31	14	42	22	36
26	A	the Goat	15	26	22	41	15	11	22	40	14	56	22	38	15	43	22	43
27	B	*Orion*'s Left	16	27	22	48	16	12	22	46	15	58	22	45	16	44	22	49
28	C	Foot.	17	28	22	54	17	13	22	52	16	59	22	51	17	45	22	55
29	D	Bulls Horn	18	29	22	59	18	14	22	58	18	00	22	56	18	46	23	00
30	E	*Andrew* Ap.	19	30	23	04	19	15	23	03	19	01	23	02	19	47	23	05

Month Days	Week Days	Remarkable days, and ſouthing of ſtars at midnight.	First Year 1729 1733 1737 1741				Second Year 1730 1734 1738 1742				Third Year 1731 1735 1739 1743				Leap Year 1732 1736 1740 1744			
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♐		South		♐		South		♐		South		♐		South	
1	F	Firſt in *Ori-*	20	31	23	09	20	17	23	08	20	02	23	06	20	48	23	1
2	G	*on's* Belt	21	32	23	13	21	18	23	12	21	03	23	11	21	49	23	14
3	A	Laſt in *Ori-*	22	34	23	16	22	19	23	16	22	04	23	15	22	50	23	17
4	B	*on's* Belt.	23	35	23	20	23	20	23	19	23	05	23	18	23	51	23	20
5	C	*Orion's* right	24	36	23	22	24	21	23	22	24	06	23	21	24	52	23	23
6	D	ſhoulder, and	25	37	23	25	25	22	23	24	25	07	23	24	25	54	23	25
7	E	*Auriga's*	26	38	23	26	26	23	23	26	26	08	23	26	26	55	23	27
8	F	right ſhould.	27	39	23	28	27	24	23	27	27	10	23	27	27	56	23	28
9	G		28	41	23	29	28	26	23	28	28	11	23	28	28	57	23	29
10	A		29	42	23	29	29	27	23	29	29	12	23	29	29	58	23	29
11	B	Shorteſt Day	♑	43	23	29	♑	28	23	29	♑	13	23	29	♑	59	23	29
12	C		01	44	23	28	01	29	23	28	01	14	23	29	02	00	23	28
13	D	Foot of the	02	45	23	27	02	30	23	28	02	15	23	28	03	02	23	27
14	E	great Dog	03	46	23	26	03	31	23	26	03	16	23	27	04	03	23	25
15	F	Bright Foot	04	48	23	24	04	33	23	24	04	18	23	25	05	04	23	23
16	G	of *Gemini*	05	49	23	21	05	34	23	22	05	19	23	23	06	05	23	21
17	A	Sun r. 8. 11	06	50	23	18	06	35	23	19	06	20	23	20	07	06	23	18
18	B	Mouth of the	07	51	23	15	07	36	23	16	07	21	23	17	08	08	23	14
19	C	great Dog	08	52	23	11	08	37	23	11	08	22	23	13	09	09	23	10
20	D	or *Syrius.*	09	53	23	07	09	38	23	08	09	34	23	05	10	10	23	06
21	E	*Thomas* Ap.	10	54	23	02	10	40	23	03	10	25	23	04	11	11	23	01
22	F		11	56	22	57	11	41	22	58	11	26	22	59	12	12	22	55
23	G	Sun r. 8. 8.	12	57	22	51	12	42	22	53	12	27	22	54	13	13	22	49
24	A		13	58	22	45	13	43	22	47	13	28	22	48	14	15	22	43
25	B	Nat. *Chriſt*	14	59	22	38	14	44	22	40	14	29	22	42	15	16	22	37
26	C	St. *Steven*	16	00	22	31	15	45	22	33	15	31	22	35	16	17	22	29
27	D	*John* Evan.	17	01	22	24	16	47	22	26	16	32	22	28	17	18	22	22
28	E	*Innocents*	18	03	22	16	17	48	22	18	17	33	22	20	18	19	22	14
29	F	Caſtor	19	04	22	08	18	49	22	10	18	24	22	12	19	20	22	05
30	G	Pollux	20	05	21	59	19	50	22	01	19	35	22	03	20	22	21	56
31	A	Sun r. 8. 1	21	06	21	49	20	51	21	52	20	36	21	54	21	23	21	47

A Table of the Variation of the Sun's Declination to every 15 Degrees of Longitude from the Meridian of *London.*

Degrees of Longitude from the Meridian of London.

Daily Varia. min.	deg 15 min	deg 30 min	deg 45 min	deg 60 min	deg 75 min	deg 90 min	deg 105 min	deg 120 min	deg 135 min	deg 150 min	deg 165 min	deg 180 min
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	02	01	01	01	01
4	00	00	00	01	01	01	01	02	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	03	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	06
15	01	01	02	02	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	07
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	01	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	06	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

IN every Page there is eleven Columns; the firſt ſhews the Days of the Month, the ſecond the Day of the Week, expreſſed by the Letters A, B, C, &c. the third the Southing of ſeveral Stars at Midnight, at which time the ſaid Stars are to be obſerved, thereby to find the Latitude; in the ſame Column is given the time of Sun Riſing (and by ſubtracting the time of Riſing from 12 Hours, the time of Setting) the eight following Columns ſhews the Sun's Place and Declination for the Firſt, Second, Third, and Leap-year, according to their reſpective Titles.

For the more ready knowing of Leap-year, the following Table is inſerted, where it is found by Inſpection, as alſo the Firſt, Second, or Third Years after Leap year.

Firſt Year	Second Year	Third Year	Leap-Year
1729	1730	1731	1732
1733	1734	1735	1736
1737	1738	1739	1740
1741	1742	1743	1744
1745	1746	1747	1748
1749	1750	1751	1752
1753	1754	1755	1756
1757	1758	1759	1760

The Uſe of the Kalendar.

To find the Day of the Week, or Month, for any Time paſt or to come, by the Kalendar.

Firſt, find the Dominical Letter for the Year, then proceed as follows

Example 1. Suppoſe it were required to find what Day of the Month will be the third Wedneſday in *March*, 1730.

Having found the Dominical Letter by the Directions in Page 22, or by the Table in Page 39, to be D, turn to the Month of *March*, and account D for Sunday, then the Letter G is for Wedneſday, and the third Wedneſday is the 18th of *March*, which was required.

Example 2. What Day of the Week will the ſecond of *September* be in the Year 1732.

This Year being Leap-year has two Dominical Letters B and A, the firſt Letter, to wit B, ſerving from the firſt of *January* to the end of *February*, to laſt Letter, to wit A, ſerves from thence to the Years end.

Wherefore looking againſt the ſecond of *September*, there ſtands G, which repreſents *Saturday*, the Day of the Week required.

Note, That the *Gregorian* or *Foreign* Account, begins 11 Days before ours, ſo that our firſt of *January* is their 12th, our 12th their 23d, our 23d, their 3d of *February*, our 24th of *February* is their 7th of *March*; but in Leap-year, our 24th of *February* is their 6th of *March*, becauſe then *February* hath 29 Days.

To

To find the Sun's Place and Declinateon by the Kalendar.

Example 1. Suppoſe the Sun's Place and Declination be required on the 10th of *January* 1729, being the firſt after Leap Year.

In the Month of *January*, in the firſt Column look the Day of the Month, over againſt which, under the firſt Year ſtands 1.34, that is, the Sun's Place is in 1 deg. 34 min. of *Aquaries*; in the next Column under the ſaid Year ſtands 19.51, under the Title South, which ſhews the Declination to be 19 deg. 51 min. Southerly; and this ſerves for the Year 1729; on the ſaid 10th of *January*, being the firſt after Leap-Year.

Example 2. Suppoſe the Sun's Place and Declination to be required on the 10th of *March* 1732, being Leap-Year.

In the Month of *March*, in the firſt Column find the Day of the Month, over againſt which under Leap year ſtands 1.07, which ſhews the Sun's Place to be in 1 deg. 07 min. of *Aries*; and in the next Column under Leap Year ſtands 00.27, which ſhews the Declination to be 27 min. Northerly, which was required.

Although it is common to take the Declination as it is in the Kalendar, yet if the Difference of Longitude be conſiderable from *London*, it is requiſite the Declination ſhould be corrected, becauſe in the Kalendar it is calculated to the Meridian of *London*, for which end the *Table of the Variation of the Sun's Declination to every 15 Degrees of Longitude from the Meridian of London*, immediately following the Kalendar is added; the Uſe and Explanation whereof follows.

IN the firſt Column is the Daily Variation, which is found by ſubtracting the Declination of the given Day of the Month, from the Declination for the Day following; or contrarily this from that, that is the leſſer from the greater, and the Difference is the daily Variation. In the head of the other Columns are degrees of Longitude from *London*, either Eaſterly or Weſterly, and in thoſe Columns under the reſpective deg. of Longitude, are the Minutes of Declination, anſwerable to the daily Variation. As ſuppoſe the daily Variation were 10 min. and the Difference of Longitude 90 deg. againſt 10 in the firſt Column, and under 90 deg. at the Head of the Table, ſtands 2 minutes, which anſwers thereto, and are to be uſed as follows.

The Uſe of the Table of the Variation of the Sun's Declmation.

The Rule. Firſt, if the Difference of Longitude be Weſterly and the Declination increaſing, the Variation found in this Table muſt be added to the Declination found in the Kalendar; but if the Declination be decreaſing, it muſt be ſubtracted therefrom.

Secondly, if the Difference of Longitude be Eaſterly, and the Declination increaſing, the Variation aforeſaid muſt be ſubtracted; but the Declination decreaſing muſt be added.

Example 1. *April* the 19th, 1732 being at Sea, the Difference of Longitude from the Meridian of *London*, being 90 degrees Weſterly, I find the

Declination in the Kalendar to be 14 deg. 56 min. North; and the 20th Day, the Declination is 15 deg. 14 min. therefore ſubtracting the leſſer Declination from the greater, the Remainder is 18 min. which is the daily increaſe. Then in the Table under 90 deg. and over againſt 19 ſtands 5 min. (which becauſe the Difference of Longitude is Weſterly and the Declination increaſing) muſt be added to 14 deg. 56 min. before found, which makes the true Declination 15 deg. 01 min. North.

If the Difference of Longitude in this Caſe had been Eaſterly, the 5 min. found in the Table muſt have been ſubtracted.

Note. It is eaſily diſcerned whether the Declination increaſe or decreaſe, by obſerving whether the Declination for the Day following be greater or leſſer; for if it be greater, then it increaſes; but if leſs then it decreaſes.

Example 2. *January* the 10th 1729, being at Sea, the Difference of Longitude from *London* being 120 deg. Weſterly, I find the Declination in the Kalendar to be 19 deg. 51 min. South, and the 11th Day it is 19 deg 36 min. therefore ſubtracting the leſſer from the greater, the Difference is 15 min. which is the daily decreaſe; then in this Table under 120 deg. and againſt 15 ſtands 5 min. which (becauſe the Difference of Longitude is Weſterly, and the Declination decreaſing) muſt be ſubtracted, which makes the true Declination 19 deg. 46 min. South. If the Difference of Longitude had been Eaſterly, the 5 min. muſt have been added.

The Uſe of the Sun's Declination to find the Latitude.

The Declination of the Sun is moſt uſeful at Sea, with the Complement of the Sun's Meridian Altitude (commonly called the *Zenith Diſtance*) taken with a Quadrant or Croſs-ſtaff, to find the Latitude of the Place; for which take the following Rules.

Rule 1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Meridian Altitude is the Latitude North.

Example. Suppoſe being at Sea, the 10th of *April* 1732, the Declination found by the Table is 12 deg. 02 min. North, the Sun comes to the Meridian in the South; the Complement of the Meridian Altitude by Obſervation is 23 deg. 10 min. What is the Latitude?

° ′
Complement of the Meridian Altitude is —— 23 10 South
Declination of the Sun is ———— 12 02 North
The Latitude of the Place is ———— 35 12 North

Rule 2. If the Sun comes to the Meridian in the North and hath North Declination, then ſubtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude North. But if the Complement of the Altitude exceed the Declination, ſubtract the Declination therefrom, and the Remainder is the Latitude South.

Example 1. Suppoſe being at Sea *May* 20th, 1732, the Declination being 22 deg. 00 min. North, the Sun comes to the Meridian in the North, and by obſerving with a Quadrant the Sun's Zenith Diſtance is 18d. 42 m. what is the Latitude of the Places?

Sun's Declination is —————— 22° 00′ North
Sun's Zenith Diſtance —————— 18 42 North
The Latitude is —————— 3 18 North

Example 2. Suppoſe being at Sea, *June* 10th 1729, the Sun's Declination by the Table is 23 deg. 29 min. North, the Complement of the Meridian Altitude, by Obſervation is 33 deg. 10 min. the Sun comes to the Meridian in the North?

Sun's Complement Meridian Altitude is —— 33° 10′ North
Sun's Declination —————— 23 29 North
The Latitude is —————— 9 41 South

Rule 3. If the Sun comes to the Meridian in the North, and have South Declination, the Declination added to the Complement of the Altitude, is the Latitude South

Example. Suppoſe being at Sea, *January* the 29th 1732: the Sun comes to the Meridian in the North, the Complement of the Meridian Altitude, is 22 deg. 10 min. What is the Latitude?

Complement Sun's Meridian Altitude is —— 22 10′ North
Sun's Declination by the Table —————— 14 49 South
The Latitude is —————— 36 59 South

Rule 4. If the Sun comes to the Meridian in the South, and have South Declination, ſubtract the Complement of the Meridian Altitude, from the Declination, the Remainder is the Latitude South. But if the Complement of the Meridian Altitude exceed the Declination, ſubtract the Declination therefrom, the Remainder is the Latitude North.

Example 1. Suppoſe being at Sea, *January* 1ſt, 1732, the Sun coming to the Meridian in the South. The Complement of the Latitude is 10 deg. 36 min. What is the Latitude?

Sun's Declination —————— 21° 44′ South
Complement Meridian Altitude —————— 10 36 South
Latitude of the Place —————— 11 08 South

Example 2. Suppoſe being at Sea, *February* 18th 1730, the Sun coming to the Meridian in the South, the Complement of the Meridian Altitude is 25 deg. 20 min. What is the Latitude?

Complement Sun's Meridian Altitude is —————— 25° 20′ South
Sun's Declination —————— 07 35 South
Latitude —————— 17 45 North

Rule 5. If the Sun be in the Zenith (that is right over head) if it have either North or South Declination, the Declination is the Latitude either North or South.

Rule 6. If the Sun have no Declination, the Complement of the Meridian Altitude is the Latitude, which is North or South, according as the Sun is to the Northward or Southward of the Equinoctial.

Days.	*Janu.* ⊙ Right Aſcenſion		*Febru.* ⊙ Right Aſcenſion		*March.* ⊙ Right Aſcenſion		*April* ⊙ Right Aſcenſion		*May* ⊙ Right Aſcenſion		*June.* ⊙ Right Aſcenſion	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
1	19	36	21	43	23	29	01	22	03	15	05	20
2	19	40	21	47	23	33	01	26	03	19	05	24
3	19	44	21	51	23	37	01	30	03	23	05	28
4	19	49	21	55	23	40	01	34	03	27	05	32
5	19	53	21	59	23	44	01	37	03	31	05	37
6	19	57	22	03	23	47	01	41	03	35	05	41
7	20	01	22	07	23	51	01	45	03	39	05	45
8	20	05	22	11	23	54	01	48	03	44	05	49
9	20	09	22	15	23	58	01	52	03	47	05	53
10	20	14	22	18	00	02	01	55	03	51	05	57
11	20	18	22	22	00	06	01	59	03	55	06	01
12	20	23	22	26	00	09	02	03	03	59	06	05
13	20	27	22	30	00	13	02	07	04	03	06	09
14	20	31	22	34	00	16	02	11	04	07	06	13
15	20	35	22	37	00	20	02	14	04	11	06	18
16	20	39	22	41	00	24	02	18	04	15	06	22
17	20	43	22	45	00	27	02	22	04	19	06	27
18	20	47	22	49	00	31	02	26	04	23	06	30
19	20	51	22	53	00	34	02	30	04	27	06	34
20	20	55	22	56	00	38	02	33	04	31	06	39
21	20	59	23	00	00	42	02	37	04	35	06	42
22	21	04	23	04	00	45	02	41	04	39	06	47
23	21	08	23	07	00	49	02	45	04	43	06	51
24	21	12	23	11	00	53	02	49	04	47	06	55
25	21	16	23	15	00	56	02	52	04	51	06	59
26	21	20	23	18	01	00	02	56	04	55	07	03
27	21	24	23	22	01	04	03	00	04	59	07	07
28	21	28	23	26	01	07	03	04	05	03	07	11
29	21	32			01	11	03	08	05	07	07	15
30	21	36			01	15	03	11	05	12	07	20
31	21	39			01	18			05	16		

Days.	*July* ☉ Right Aſcenſion		*Auguſt* ☉ Right Aſcenſion		*Septem.* ☉ Right Aſcenſion		*October* ☉ Right Aſcenſion		*Novemb* ☉ Right Aſcenſion		*Decem.* ☉ Right Aſcenſion	
	H.	M.	H.	M.	H.	M.	H	M.	H.	M.	H.	M.
1	07	24	09	26	11	20	13	09	15	08	17	16
2	07	28	09	30	11	24	13	13	15	12	17	21
3	07	32	09	34	11	27	13	16	15	16	17	26
4	07	36	09	38	11	31	13	20	15	20	17	30
5	07	40	09	41	11	34	13	23	15	24	17	35
6	07	44	09	45	11	37	13	27	15	28	17	39
7	07	48	09	49	11	42	13	31	15	32	17	43
8	07	52	09	52	11	45	13	35	15	37	17	47
9	07	56	09	56	11	49	13	39	15	41	17	52
10	08	00	09	59	11	50	13	42	15	46	17	57
11	08	04	10	03	11	56	13	46	15	50	18	01
12	08	08	10	07	12	00	13	50	15	54	18	06
13	08	12	10	11	12	03	13	54	15	59	18	10
14	08	16	10	15	12	07	13	58	16	03	18	15
15	08	20	10	18	12	10	14	01	16	08	18	20
16	08	24	10	22	12	14	14	05	16	12	18	24
17	08	28	10	26	12	18	14	09	16	16	18	29
18	08	32	10	29	12	21	14	13	16	20	18	34
19	08	36	10	33	12	25	14	17	16	24	18	38
20	08	40	10	36	12	28	14	21	16	29	18	43
21	08	44	10	40	12	32	14	25	16	33	18	46
22	08	48	10	44	12	36	14	29	16	37	18	50
23	08	52	10	48	12	39	14	33	16	41	18	55
24	08	56	10	51	12	43	14	37	16	45	18	59
25	08	59	10	54	12	46	14	40	16	50	19	04
26	09	03	10	58	12	50	14	44	16	54	19	08
27	09	07	11	02	12	54	14	48	16	58	19	12
28	09	11	11	05	12	58	14	52	17	03	19	17
29	09	15	11	09	13	02	14	56	17	07	19	21
30	09	18	11	12	13	06	15	00	17	12	19	26
31	09	22	11	16			15	04			19	31

A Table ſhewing the Right Aſcenſion, Declination, and Magnitude of the Principal Fixed Stars.

Names of the Stars.	Magnit	Right Aſcenſi.		Decli- nation.		
		H.	M.	D.	M.	
Pole Star	2	00	32	07	51	N
Girdle of Andromeda	2	00	50	33	50	N
Bright Star of Aries	2	01	52	22	10	N
Meduſa's Head	2	02	49	39	54	N
Right Side of Perſeus	2	03	05	48	52	N
Aldebaran, or Bull's Eye	1	04	18	15	55	N
Capella, or the Goat	1	04	55	45	41	N
Bright Foot of Orion	1	05	01	08	33	S
Middle Star in Orion's Belt	3	05	20	01	25	S
Orion's Right Shoulder	1	05	39	07	19	N
Auriga's Right Shoulder	2	05	44	44	53	N
Bright Foot of Gemini	2	06	19	16	38	N
Syrius, or the Great Dog	1	06	33	16	21	S
Caſtor, or Northermoſt Twin	2	07	16	32	27	N
Procyon, or the Little Dog	2	07	24	05	54	N
Pollux, or Southermoſt Twin	2	07	25	28	39	N
Hydra's Heart	1	09	14	07	29	S
Lyon's Heart, or Regulus	1	09	54	13	16	N
The Lower of the Pointers	2	10	41	57	50	N
The Upper of the Pointers	2	10	43	63	13	N
Lyon's Tail	1	11	31	16	05	N
Upper of two Laſt in the Square of the Great Bear	2	12	02	58	34	N
Laſt but two in the Great Bear's Tail	2	12	40	57	27	N
Virgins Spike	1	13	11	09	44	S
Laſt but one in the Great Bear's *Tail*	2	13	10	56	21	N
Laſt in the Great Bear's *Tail*	2	13	34	50	42	N
Arcturus	1	14	02	20	38	N
South Ballance	2	14	32	14	54	S
Foremoſt Guard	2	14	51	75	15	N
Brighteſt of the Crown	2	15	21	27	38	N
Brighteſt of the Serpent's Neck	2	15	33	07	18	N

Antares, the Scorpions Heart	1	16	12	25	47	S
Head of Hercules	3	17	02	14	43	N
Ophiucus, or Serpent's Head	3	17	22	12	47	N
Lyra, or the Harp	1	18	27	38	33	N
Swan's Bill	3	19	17	27	29	N
Vulture, or Eagles Heart	2	19	34	08	10	N
Swan's Tail	2	20	30	44	19	N
Mouth of Pegaſus	3	21	27	08	39	N
Fomelhaut	1	22	41	31	03	S
Marchab, or Pegaſus Wing	2	22	48	13	44	N
Scheat, or Pegaſus Leg	2	22	50	26	36	N
Cephus's Knee	3	23	20	76	07	N
Andromeda's Head	2	23	53	27	35	N
End of Pegaſus Wing	2	23	57	13	39	N

The Explanation and Uſe of the TABLE *of the Sun's Right Aſcenſ.; and of the Table of the Star's Right Aſcenſion and Declination*

IN the Table of the Sun's Right Aſcenſion, the firſt Page contains the firſt ſix Months of the Year; the next Page the other ſix Months. At the Head of the Table are the Months; in the firſt Column towards the Left Hand are the Days of the Month, and in the oppoſite Column is the Right Aſcenſion in Hours and Minutes.

In the Table of the *Fixed Stars*, there are four Columns; in the firſt towards the Left hand, are the Names of the Stars; in the Second, the Star's Magnitude; in the third, the Right Aſcenſion in Hours and Minutes; in the fourth, their Declination in Degrees and Minutes, North or South.

First, to find the time of the Star's coming upon the Meridian.

The Rule. Look the Right Aſcenſion of the Sun and Star, and ſubtract the Right Aſcenſion of the Sun from the Right Aſcenſion of the Star, but if the Star's Right Aſcenſion be leſs than the Sun's, add thereto 24 hours, and then ſubtract; the Remainder after ſubtraction is the time of the Stars coming upon the Meridian from Noon: But if the Remainder exceed 12 Hours, ſubtract 12 Hours therefrom, and then the Remainder is the time from Midnight.

Example 1. Suppoſe the time that *Fomelhaut* comes upon the Meridian on the 10th of *October* is required.

I find in the Table of the Star's Right Aſcenſion to be 22 hours 41min. and the Sun's to be 13 deg 42 min which ſubtracted from the Star's Right Aſcenſion, leave 8 hours 59 min. the time of the Star's coming upon the Meridian, Afternoon

Example 2. Suppoſe the time that the *Bull's Eye* comes upon the Meridian on the 15th of *October* were required.

I find the Star's Right Aſcen. to be 4 hours 14 min. the Sun's 14 hours 1 min. Now becauſe the Sun's Right Aſcenſion is more than the Star's, add to the Star's Right Aſcenſion 24 hours, which makes 28 hours 18 min. from which ſubtracting the Sun's Right Aſcenſion 14 hours 1 min. there remains 14 hours 17min. from which ſubtracting 12 hours, there remains 2 hours 17 min. which is the time of the Star's Southing after Midnight, as was required.

Secondly, The Time being given, to find what Star will come to the Meridian about the ſame time.

The Rule. To the Sun's Right Aſcenſion add the time from Noon, at which the Star's coming to the Meridian is deſired; the Sum is the Right Aſcenſion of the Star that will come to the Meridian at that time; with which enter the Table of the Star's Right Aſcenſion and Declination, where look what Star's Right Aſcenſion agrees with the Right Aſcenſion before found, or neareſt thereto, and that is the Star ſought for.

Example. Suppoſe *March* 27th, I deſire to know what Star will come upon the Meridian about 8 at Night.

The Sun's Right Aſcenſion is 1 hour 4 Minutes: the time from Noon is 8 hours, which added to the Sun's Right Aſcenſion makes 9 hours, 4 minutes: the neareſt in the Table is *Hydra'ſ Heart*, whoſe Right Aſcenſion is 9 hours 14 Minutes, and therefore Souths at 8 hours 8 minutes, and ſo in others.

Directions for Obſervations of the Stars, to find the Latitude of the Place

Having before ſhewn how to find the Time of a Star's coming to the Meridian, I ſhall now ſhew by the Star's Altitude, how to find the Latitude.

Note, In North Latitude, thoſe Stars whoſe North Declination exceed the Complement of the Latitude may be obſerved under the Pole. And the ſame may be performed by the Southern Stars in South Latitude,

Directions for finding the Latitude, by the Meridional Altitude of the Fixed Stars.

Rule 1. If the Star comes to the Meridian in the South, and hath North Declination, the Complement of the Altitude (by Obſervation) added to the Declination of the Star, found in the Table of the Star's Right Aſcenſion and Declination gives the Latitude North

Example On the 10*th* of *January*, being at Sea, I find by the foregoing Directions that the *Lyons Heart* comes to the Meridian in the South at 1 hour, 37 minutes after midnight, the Meridian Altitude by Obſervation was 63 Degrees; which ſubtracted from 90 Degrees, there remains 27 degrees the Complement of the Altitude; to which adding 13 degrees 16 Minutes the Declination of the Star North, gives 40 degrees 16 minutes the Latitude of the Place North, which was required.

Rule 2. If a Star comes to the Meridian in the South, and have South Declination, ſubtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North. But if the Declination exceed the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1. Suppoſe on the 10th of *July*, being at Sea, the Star *Fomelhaut* coming to the Meridian in *South*, at 2 hours 41 min. after Midnight, the *Merid. Alt.* 35 deg. 50 min. the Compl. whereof is 54 deg. 10 min. the Star's Declination is 31 deg 03 min. *South*; which ſubtracted from the Compl of *Alt.* leaves 23 deg 07 min. which is the Latitude North.

Example 2. Suppoſe on the 20th of *June*, being at Sea, the *Scorpion's Heart* comes to the Meridian in the South at 9 hours 33 min at Night, the Complement of the Altitude is 5 deg. 27 min. the Declination 25 degrees 46 minutes South; from which ſubtracting the Complement of the Altitude there remains 20 deg. 19 min which is the Latitude South.

Rule 3. If a *Star* comes to the Meridian in the North above the Pole, and have North Declination, ſubtracting the Declination from the Complement of the Altitude, the Remainder is the Latitude South But if the Declination exceeds the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, the Remainder is the Latitude North.

Example 1. On the 11th of *June*, the *bright'ſt in the Harp* comes to the Meridian in the North at 26 minutes after Midnight, the Complement of the Altitude is 79 degrees, from which ſubtracting the Declination, which is 38 deg. 33 min. North, there remains 40 degrees 27 minutes, which is Latitude South

Example 2. On the 8th of *September*, *Andromeda's Head* comes to the Meridian in the North at 8 minutes after Midnight, the Complement of the Altitude is 7 deg. 10 min. which ſubtracted from the Declination 27 deg. 35 min. gives 20 deg. 25 min. which is the Latitude North.

Rule 4. If a *Star* comes to the Meridian in the North, and have South Declination, the Complement of the Altitude added to the Declination gives the Latitude South.

Example. On the 12th of *Decemb. Syrius (or the Great Dog's Mouth)* comes to the Meridian in the North at 26 minutes after Midnight, the Complement of the Altitude is 30 degrees, to which adding 16 deg. 20 min. the Declination South, gives 46 deg. 20 min. the Latitude South.

Rule 5. If a *Star* comes to the Meridian under the Pole, then add the Complement of the Declination to the Meridian Altitude, and the Sum is the Latitude either North or South, according to the Star's Declination.

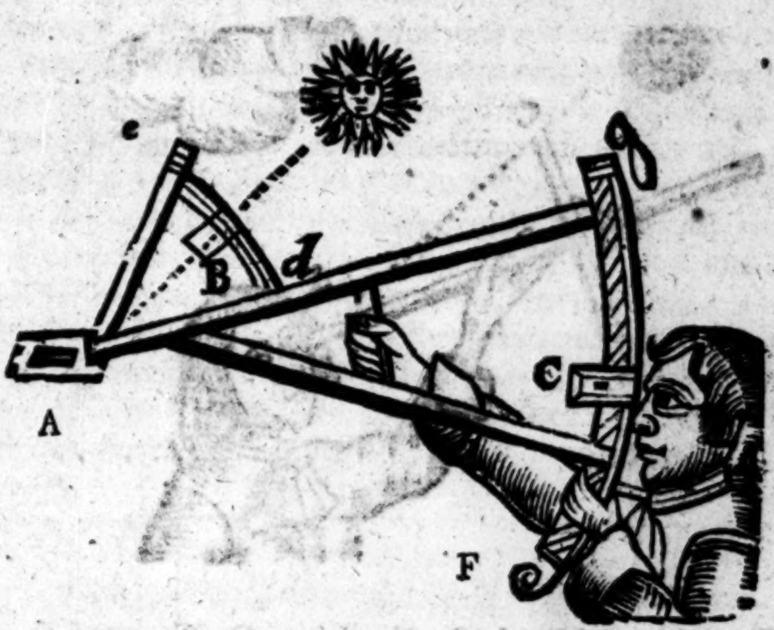
Example. On the 10th of *March*, the Pole Star comes to the Meridian under the Pole, at 30 min. after midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the Declination 2 deg. 09 min. which added together gives 46 deg. 39 min. which is the Latitude North.

Rule. 6. If the *Star* be in the Zenith, the Declination is the Latitude either North or South according to the Declination of the Star.

Rule 7. If the *Star* have no Declination, the Complement of the Meridian Altitude is the Latitude of the Place either North or South according as the *Star* is either to the Northward or Southward.

The Deſcription and Uſe of the Sea-Quadrant.

THIS Inſtrument conſiſts of three Vanes and two Arches, the Horizon Vane, which in obſerving, reſpects the Horizon as at A. The Shadow Vane, ſo called becauſe of its giving the ſhadow upon the Horizon Vane in time of Obſervation, as at B. Laſtly, the Sight Vane, which in time of Obſervation is placed at the Eye, through which the Shadow and Horizon are ſeen, as at C. The leſſer of the Arches marked with *d e*, is called the *Sixty Arch*, becauſe it contains 60 (or more commonly of late 65) degrees. In time of Obſervation, the Shadow Vane is placed upon this Arch always to an even Degree, it is numbred from the upper-end at *e*, downward to *d*, with 5, 10, 15, 20, &c. The bigger Arch marked with g *F*, is called the *Thirty Arch*, becauſe it contains 30 (or rather 25) degrees, it is divided into degrees and minutes.

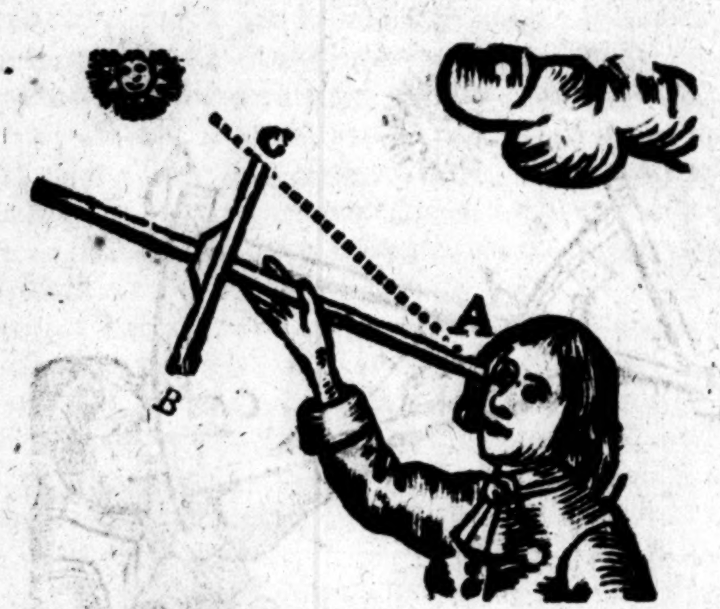


The Uſe of this Inſtrument is to take the *Sun's* Meridian Altiude, which is done in the manner following.

Put the Horizon Vane upon the End of the Quadrant at A, the ſhadow Vane upon the ſixty (or leſſer Arch) to a Number of Degrees leſs than the Complement of the Altitude by 15 or 20deg and the Sight Vane upon the Thirty Arch. The Vanes being thus fixed upon the Quadrant, the back being turned towards the *Sun*, and the Sight Vane placed to the Eye, look thro' the ſaid Sight Vane, and cauſe the Shadow of the upper edge of the ſhadow Vane to fall upon the upper part of the ſlit in the Horizon Vane, where uſually (for Perſpicuity ſake) there is drawn a black Line; and if at the ſame time the Horizon appear thro' the ſaid ſlit in the Horizon Vane, that is the *Sun's* preſent Altitude; but if the *Sea* appear inſtead of the Horizon, then ſlide the Sight Vane lower towards F; if the Sky appear inſtead of the Horizon, then ſlide the Sight Vane a little higher, until the Horizon appear through the Horizon Vane. But to obtain the Meridian

Altitude, which is the greateſt Altitude the *Sun* will have that Day and is the thing uſed to find the Latitude, continue obſerving, and as the *Sun* riſes the Sea will appear through the Horizon Vane; then muſt the ſight Vane be removed lower: And thus continue obſerving, as often as may be convenient, till the Sun be at the Higheſt, which is the Meridian Altitude. When the *Sun* begins to fall, the Sky will appear inſtead of the Horizon, and then it's time to give over obſerving for that Day. Having thus done, add the degrees upon the Sixty-Arch to the Degrees and Minutes upon the Thirty-Arch, and the Sum is the Complement of the Meridian Altitude; the Uſe of which for finding the Latitude, is ſufficiently ſhewed in the proceeding Rules.

The Deſcription and Uſe of the Croſs-ſtaff, *or* Fore-ſtaff



THIS Inſtrument conſiſts of a Staff and four Croſſes, the firſt and ſhorteſt is called the Ten Croſs, and it belongs to that ſide of the Staff which is Numbred from about 3 degrees to 10 degrees. Sometimes the Thirty Croſs and the reſt of the Croſſes are ſo made, as that the Breadth thereof, ſerves inſtead of this Ten-Croſs.

The ſecond Croſs is called the Thirty Croſs, and belongs to that ſide of the Staff which is Numbred from about 10 deg to 30.

The Third Croſs is called the Sixty-Croſs, and belongs to that ſide of the Staff which is Numbred from about 20 to 60 Degrees

The fourth and laſt Croſs is called the Ninety Croſs, and belongs to that ſide of the Staff which is Numbred from about 30 to 90 degrees.

This Staff is likewiſe Numbred with the Complement to 90 degrees, (*viz.*) at 10 ſtands 80, at 20 ſtands 70, at 30 ſtands 60, and ſo the reſt.

The Uſe of this Inſtrument is to take the Meridian Altitude of the *Sun* or *Stars*, which is done as followeth, Firſt, Conſider how great the Sun's Meridian Altitude will be that Day; and accordingly uſe the Croſs moſt ſuitable, (*viz.*) if the Meridian Altitude be judged to be under 10 deg. uſe the Tenth-Croſs; if between 10 and 30, the Thirty-Croſs; if betwern 30 and 60, the Sixty-Croſs; if between 60 and 90, the Ninety-Croſs, which is ſeldom uſed.

Having put on the Croſs, place the flat end of the Staff at A, to the outſide of the Eye, as near as may be, without hindring the ſight: Thus the Face being towards the Sun or Star, hold the Croſs upright; then look at the upper End of the Croſs at C for the Sun or Star, and at the lower End at B for the Horizon, and if the Sea appears inſtead of the Horizon, remove the Croſs a little farther from the Eye; but if the Sky appear inſtead of the Horizon, remove the Croſs a little nearer to the Eye, until the Sun or Star appear at the upper End, and the Horizon at the lower End; which when they do, then upon the ſide of the Staff belonging to the Croſs uſed in Obſervation, will be found the Deg. and Min. of Altitude of the Sun or Star. But the greateſt Altitude being that which is required, Obſervation muſt be continued as frequently as Judgment ſhall direct, until the Sun or Star be at the higheſt; and as the Sun or Star riſes, the Sky will appear inſtead of the Horizon; but when the Sun or Star is paſt the Meridian, and begins to fall, the Sea will appear inſtead of the Horizon, and then is the Obſervation finiſhed; and upon the ſide of the Staff proper to the Croſs uſed, are found the Deg. and Min. of the Sun's Meridian Altitude; which ſubtracted from 90 deg. gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbred with the Complement as is ſhewed before) with which to proceed in finding the Latitude of the Place, obſerve the Rules and Directions aforegoing.

The Deſcription and Uſe of the Nocturnal.

IT conſiſts of Three Parts, The firſt and unmoveable Part, on which is the Handle, by which to hold it in time of Obſervation; upon the foreſide of which, in the outermoſt Circle are the Days of the Month, and upon the innermoſt are ſet off the 24 Hours, and upon the Back ſide are the 33 Points of the Compaſs.

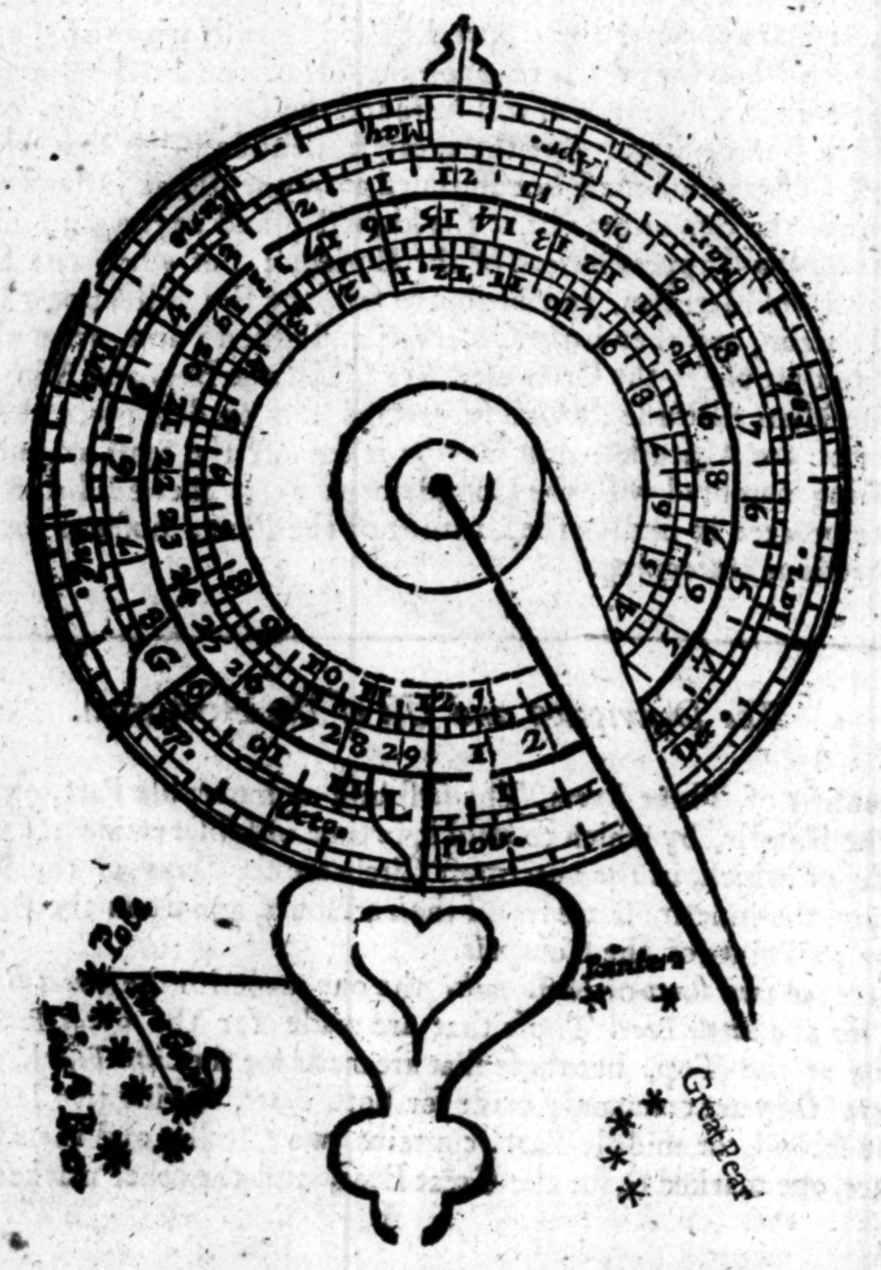
There are two ſorts of *Nocturnals*, the one made for the *Great Bear*, the other for the *Little Bear*. Thoſe that are made for the *Great Bear* have *February* at the Top, but thoſe that are made for the *Little Bear* have *April*, but now they are commonly made for both *Bears*, having two Indexes.

The ſecond, or middle Part, contains two Circles, and the aforeſaid Indexes, one marked *G*, for the Great Bear, and the other marked *L*, for the Little Bear. The outermoſt Circle is divided into 29 Days and a half, being the Moon's Age; the innermoſt into 24 Hours: The Index belonging to the Bear you intend to obſerve by, is to ſet to the Day of the Month at pleaſure

The third and uppermoſt Part is a long Index; the Edge of which (that reſpects the Center) muſt be turned to the Guards or Pointers, in time of Obſervation.

To find the Hour of the Night, and upon what Point of the Compaſs the Guards are.

The Figure of the Nocturnal.



To do this, Firſt, ſet the Index of the middle Part to the Day of the Month, then hold the Inſtrument upright, which may be deſcerned by the Tip of the Top of the *Nocturnal*, then look through the Hole in the middle of the *Nocturnal* for the *North Star*; which having found, turn the Edge of the long Index to the Guards or Pointers, according as you obſerve by the Little or Great Bear, then ſhall the Edge of the Index (upon the innermoſt Circle of the middle Part) give the Hour of the Night.

Alſo in *Nocturnals* made for both Bears, you have on the Backſide two Circles marked at the Bottom, the outermoſt with *L*, and the innermoſt with *G*; and numbred round with Degrees and Minutes, for finding how much the *Pole Star* is above or below the true Pole; to find which having fitted the *Nocturnal*, as before directed, obſerve what Figures on the Backſide fall under the Edge of the long Index, in the Circle belonging to the Bear, by which you obſerve, and that is the Deg. and Min. that the Star is above or under the Pole, as is diſtinguiſhed by the Words *Abo.* & *Und.*

Example. I obſerve by the *Great Bear*, *Sept.* 6, I ſet the Index marked G, to *Sept.* 6, and looking thro' the Hole to the Pole, I turn the long Index till it lie juſt over the two Pointers, as you ſee in the Figure of the *Nocturnal*, and find out the innermoſt Circle of the middle Part of the *Nocturnal*, that it is 2 a Clock in the Morning; and on the Back ſide in the Circle marked *G*, I find the Pole Star is 2 deg. 26 min. above the Pole, &c. 'Tis found alſo by the following Table.

To find the Moon's Southing, and Time of Full Sea by the Nocturnal.

TO do this, It is but looking upon the middle Piece of the *Nocturnal*, and in the outermoſt Circle find the Moon's Age; and oppoſite to it in the innermoſt Circle of the ſame Piece ſtands the Southing.

Ex. Suppoſe the *Moon* 25 days old and the time of her Southing requir'd. Look for 25, the *Moon*'s Age in the outermoſt Circle, oppoſite to which in the innermoſt Circle ſtands 8, which is the *Moon*'s Southing at 25 days old required.

Note, That always between the Change and the Full, the Moon comes to South in the Afternoon, but after the Full in the Morning.

Thus having found the *Moon*'s Southing, add thereto the time of Flowing upon the Full and Change-days at any Place, and that gives the time of Full Sea when required. But this hath been ſufficiently ſhewed in another Place, therefore needs no Example.

The Uſe of the following Table of the Declination of the North Star.

THE Uſe of the Table is this: Having taking the Alt. of the Pole Star, then obſerve with the *Nocturnal* upon what Point of the Compaſs the Guards are; oppoſite to which in this Table ſtands the Declination (ſo called) which if the Star be below the Pole, is to be added to the Alt. but if the Star be above the Pole, to be ſubtracted therefrom to find the Latitude of the Place.

But the more exact way to find the Latitude, is by thoſe other Directions for the Stars before given.

A Table of the Declination of the North Star, *upon every Point of the Compaſs the Guards are upon, for both Sorts of* Nocturnals.

	Points of the Compaſs.	For the Guard of the Little Bear. D.	M.			For the Guards of the Great Bear, called the two Pointers. D	M	
If the former of the Guards be aſcending from the North or lower Part of the Meridian,	North	2	09	Above the Pole	If the after Wheels, or two Pointers be aſcending from the North or loweſt part of the Merid.	2	20	Above the Pole
	N by E	1	52			2	30	
	N N E	1	29			2	35	
	N E by N	1	02			2	33	
	N E	0	35			2	26	
	N E by E	0	06			2	13	
	E N E	0	22.	The North Star is under the Pole.		1	55	
	E by N	0	52			1	33	
	Eaſt	1	18			1	07	
	E by S	1	41			0	38	
	E S E	2	01			0	08	
	S E by E	2	16			0	22	The North Star under the Pole
	South Eaſt	2	15			0	52	
	S E by S	2	30			1	20	
	S S E	2	29			1	44	
	S by E	2	22			2	04	
If the former of the Guards be deſcending, from the South, or upper Part of the Merid	South	2	11		If the two Pointers be deſcending from the South or upper Part of the Merid.	2	20	
	S by W	1	55			2	30	
	S S W	1	34			2	29	
	S W by S	1	10			2	27	
	South Weſt	0	43			2	23	
	S W by W	0	14			2	13	
	W S W	0	15	Above the Pole		1	55	
	W by S	0	44			1	33	
	Weſt	1	11			1	07	
	W by N	1	31			0	38	
	W N W	1	58			0	08	
	N W by W	2	14			0	22	Ab. the Pole
	North Weſt	2	25			0	52	
	N W by N	2	30			1	20	
	N N W	2	29			1	44	
	N by W	2	22			2	04	

A Table of the Latitude and Longitude of the Principal Harbours, Headlands, and Iſlands in the World; Corrected by the lateſt and beſt Obſervations: accounting the Longitude from the Meridian of the LIZARD.

Note, *When the Latitude and Longitude of an Iſland is given, the middle of the Iſland is meant, except ſome particular Part of it be expreſſed.*

Places Names	Latitude North		Longit. E. or W		
The Coaſt of England	D	M	D	M	
BErwick	55	50	03	35	E
Newcaſtle	54	58	03	44	E
Stockton	54	33	03	49	E
Spurn	53	35	05	44	E
Yarmouth	52	45	06	54	E
LONDON	51	32	05	14	E
North Foreland	51	28	06	24	E
Beachy	50	48	05	39	E
Dunnoſe I. Wight	50	38	03	51	E
Portland	50	30	02	26	E
Start Point	50	09	02	29	E
LIZARD	49	55	00	00	—
Lands-end	50	06	00	46	W
St. Mary's Scilly	49	57	01	31	W
Hartland Point	51	06	00	39	E
Lundy Iſle	51	20	00	34	E
Briſtol	51	32	02	39	E
St. David's head	51	55	00	0 8	W
Barſey Iſle	52	46	00	16	E
Holy-head	53	23	00	34	E
Liverpool	53	20	02	16	E
White-haven	54	25	01	59	E
Carliſle	54	45	02	49	E
The Coaſt of Scotland					
Glaſcow	55	53N	01	09	E
N. part of Sky Iſle	57	50N	00	07	W

North Latitude

Places Names	Latitude North		Longit. E or W.		
	D	M	D	M	
North part of Lewis Iſland	58	20	02	01	W
St. Kilday	58	02	04	51	W
Farra Head	58	23	00	09	
Northern Iſles of Orkney	59	13	01	44	
Shetland S. point	59	52	03	44	
Duchaneſs	57	55	0	54	
Aberdeen	57	24	03	37	
Dundee	56	30	02	38	
Edenburgh	55	57	02	28	
The Coaſt of Ireland					
Dublin	53	20	01	52	
Wexford	52	13	02	02	
Waterford	52	07	02	38	
Cork	51	49	04	16	
Cape Clear	51	10	05	16	
Limrick	52	22	04	34	
Galway	53	10	04	49	
Sline-head	53	20	06	01	
Londonderry	54	55	02	46	
Bellfaſt	54	36	01	36	
The Caſt of Holland and Flanders					
Scaw	57	26N	15	24	E
Heligbland	54	28N	13	49	E

North Latitude

Eaſt Longitude

North Latitude

Weſt Longitude

Places Names	Latitude North D.	M.		Longit. E. or W. D.	M.	
Hambrough	53	41		15	38	
Emden	53	05	North Latitude	13	14	Eaſt Longitude
The Fly	53	18		10	49	
The Texel	53	10		10	13	
Amſterdam	52	21		10	05	
Rotterdam	51	55		9	35	
The Brill	51	56		9	24	
Sluyce	51	19		9	04	
Calice	50	57		7	14	
The Coaſt of France and Portugal.						
Diep	49	56		04	08	
Cape de Hague	49	46		03	08	
Caskets	49	50		02	42	
Guernſey	49	36		02	34	
Morlaix	48	37		01	24	Eaſt Longitude
Uſhant	48	30		00	09	
Breſt	48	23		00	50	
Penmark	47	48		00	59	
Bell Iſle	47	20	North Latitude	02	04	
Nantz	47	14		03	25	
Iſland Dieu	46	40		02	59	
Iſland Ree	46	13		03	44	
Rochel	46	10		04	00	
Bourdeaux	44	50		04	50	
Bilboa	43	30		02	14	
Cape Ortegal	44	02		02	26W	
Cape Finiſter	43	06		04	46W	
Porta Port	41	18		04	06W	
Burlings	39	39		05	01W	
Rock of Lisbon	38	54		05	06W	
Cape St. Vincent	37	00		04	18W	
Cadiz	36	16		01	46W	
Cape Trefalgar	36	10		01	16W	
The Coaſt on the Main Continent within the Straits						
Gibralter	36	11N		00	29W	
Cape de Gat	37	03N		03	12 E	

Places Names	Latitude North D.	M.		Longit. E or W. D.	M.	
Cape Paul	37	58		04	52	
Cape Marrin	39	00		05	42	
Barcelona	41	30		07	35	
Marſeilles	43	20		10	29	
Toulon	43	06		10	54	
Genoa	44	25		13	54	
Leghorn	43	18		15	43	
Rome	41	51		17	42	
Naples	41	05		19	42	
Cape Spartavento	38	00		25	12	
Cape Collone	39	10		23	14	
Gallipoli	40	08		23	53	
Cape St. Mary	39	56		24	14	
Ancona	43	31		19	54	Eaſt Longitude
Venice	45	18	North Latitude	18	24	
Lepanto	38	20		27	09	
Cape Metapan	36	35		27	34	
Cape St. Angelo	36	41		28	34	
Athens	38	00		29	43	
Cape Martelo S, P. of Negropont	38	00		30	59	
Cape Monte Sancto	40	05		31	19	
Gallipoli	40	30		33	12	
Conſtantinople	41	07		35	14	
Smyrna	38	30		32	41	
Epheſus	37	54		32	29	
Antiocheta	36	40		36	51	
Scandaroon	36	00		41	12	
Tripoli	34	40		40	54	
Alexandria	31	07		36	04	
Cape Ruſato	33	15		27	09	
Cape Miſerato	32	43		21	37	
Tripoly	32	55		18	14	
Cape Bona	37	05		15	14	
Bona	37	00		12	14	
Algier	36	40		08	19	
Cape de tres forcas	35	34		03	49	

Tetuan

Places Names:	Latitude North. D.	M.		Longit E. or W. D.	M	
Tetuan	35	28	N	00	3	W
Seuta	35	55	N	00	33	W
Tangier	35	55	N	01	00	W
Iſlands within the Straits			North Latitude			East Longitude
Alboran	36	10		2	44	
Formentaria	38	44		7	4	
Yvica	39	05		8	4	
Minorca City	39	48		7	54	
Port Maon Minorca	39	42		9	36	
Gallitta	37	40		13	48	
Sardinia South End	39	12		13	48	
Corſica North End	42	57		14	59	
Gorgona	43	34		14	52	
Captia	43	06		14	54	
Lilboa	42	44		15	19	
Meſſina	38	22		11	39	
Marittimo	38	12		17	9	
Cape Paſſero	36	48		21	18	
Malta	36	15		19	49	
Corfu	39	45		25	56	
Chefalonia	38	15		27	3	
Zant	37	47		26	24	
Modon on Morea	36	52		26	46	
Lemnos	39	50		30	41	
Scio	38	20		29	9	
C. St. John Weſt end of Candy	35	20		28	41	
C Solomon Eaſt end of Candy	35	25		31	45	
Rhodes City	36	40		33	14	
Weſt end of Cyprus	35	21		36	49	
Eaſt end of Cyprus	35	35		39	39	
The Coaſt of Barbary and Guinea			North Latitude			Weſt Longitude
Cape Spartel	35	46		00	41	
Sallee	33	43		1	16	
Cape Cantin	32	16		4	6	
Cape de Ceer	30	4		4	56	
Cape Bajador	26	12		9	16	
Cape Olerado	23	41		10	36	
Cape Blanco	20	35		11	41	
Senegall	15	16		10	26	

Places Names	Latitude N. or S D	M		Lougit. E. or W. D.	M	
Cape de Verde	19	30		11	12	W
River Gambia	13	16		10	6	W
Serralion	8	36		7	1	W
Monſerado	6	5		4	6	W
Cape Palmos	4	3	North Latitude	0	22	W
Jaque Jaque	4	16		2	44	East Longitude
Aſſene	4	15		4	14	
Cape Three Points	4	13		5	59	
River Volto	5	40		8	44	
River Formoſa	7			12	54	
Cape Formoſa	4	40		13	14	
New Callabar	4	12		15	39	
Old Callabar	3	18		6	46	
River Camerones	4	2		18	24	
River de Angra	0	49		18	29	
Lopas	1	5	South Latitude	17	34	
River Congo	5	45		20	39	
Angola	8	51		21	10	
Cape Negro	16	8		20	00	
Cape St. Thomas	23	10		19	37	
Secos	28	56		20	46	
Cape Bona Eſperance	34	25		22	29	
Weſtern Iſlands			North Latitude			Weſt Longitude
Corvo	00	05		24	41	
Flores	39	40		24	36	
Fyal	38	53		22	02	
Pico	38	32		21	17	
St George	38	56		20	56	
Tercera	38	53		19	28	
St Michael	38	00		17	18	
St. Maries	37	00		17	03	
The Canary Iſlands			North Latitude			Weſt Longitude
Ferro	28	00		12	58	
Palma	28	50		12	46	
Gomero	28	00		12	12	
Teneriff	28	20		11	31	
Madera Weſt end	32	17		12	08	
Porto *Sancto*	22	50		10	36	
Canaria	27	56		10	22	
Fortaventura	27	54		08	10	
Lancerota	28	38		07	40	

Places Names	Latitude N or S		Longit. E. or W.	
Cape de Verd Iſlands	D. North Latitude	M.	D. East Longitude	M.
St. Antonio	17	10	30	34
St Vincent	16	55	30	24
St Lucia	16	45	39	16
St Nicholas	16	40	29	36
Brava	14	35	29	52
Fuogo	14	42	29	14
Jago	15	20	28	24
Iſle of May	15	16	27	26
Iſle Sal	16	45	27	16
Bonaviſta	16	05	27	09
Southern Iſlands				
St Matthews	01	40 S	01	19 E
Aſcenſion	08	10 S	07	21 W
St Helena	16	06 S	00	26 W
Fernandepo	02	35 N	17	09 E
Princeps	01	25 N	16	14 E
St Thomas	00	00 —	15	12 E
Annabona	01	42 S	14	02 E
The Coaſt on the Main Continent in the Eaſt Indies				
Cape Lagulias	35	35 S	23	54
Cape Corientes	23	52 S	40	49
Moſambique	15	05 S	45	44
River de Fugos	00	00 —	46	29
CapeBaſſos	04	00	55	04
Cape Guradafoy	11	50	57	44
Cape Roſulgat	22	27	65	59
Cape Muca	26	56	62	24
Buſſera	30	00	54	19
Surrat	21	08	78	39
Goa	15	22	79	51
Calecute	11	17	80	08
Cochin	09	58	81	59
Cape Gomerine	07	50	83	39
Fort St George	13	08	86	56

Places Names	Latitude N or S		Longit E or W.	
	D. North Latitude	M.	D.	M.
Dew point	15	50	87	19E
Viſegapatam	17	40	90	21E
C. Palmaris	20	45	93	24E
Bengal	22	27	97	03E
C. Negrais	26	23	98	19E
Malacca	20	25	108	34E
Siam Entrance	13	10	106	15E
Cambodia Ent	10	30	110	34E
Cochin	18	25	109	12E
Cantam	23	30	113	34E
Amoy or Quemoy	24	35	122	09E
Lampo	30	10	125	39E
Nanquin	32	52	125	19E
Iſlands in the Eaſt Indies				
	D. South Latitude	M.	D. East Longitude	M.
Madagaſc. St. Laure. S end	26	06	51	34
Madagaſc. St. Laure. N end	12	10	55	24
Mayetta	13	10	50	59
Mohilla	12	15	48	55
Comero	11	50	48	59
St Juan do Nova	17	30	47	49
Mauritius	20	05	60	19
Digo Royes	19	45	66	49
Romeras de Caſtelamos	29	05	72	10
Amſterdam	39	50	79	38
St. Brandon	16	38	69	44
DigoGratioſa	08	42	74	19
Quabella	03	49	57	53
Baſſos de Chagos	05	05	75	39
Yas de Digo Rays	00	00 —	77	19
	D. North Latitude	M.		
Maldavia N. end	07	05	78	19
Maldavia S. end	01	00	81	29
Malique	09	00	78	29
Sacatra	12	28	60	51
Abdeleur	12	10	59	37
C. Gallo inZelone	06	07	85	59

Yas

Places Names:	Latitude N or S.			Longit. E. or W.		
	D.	M.		D.	M	
Yas de Amber	00	00	N. Latitude	57	44	Eaſt Longitude
Andaman	13	00		96	39	
Nicobor	07	05		98	09	
Sumatra NW. end	05	28		98	59	
Verkirs Iſland	02	22		96	21	
Naſſau Iſland	02	44	South Latitude	103	46	
Bencola	03	50		106	27	
Sumatra *S E.* end	05	42		109	18	
Engano	05	40		106	07	
Selam	08	20		107	27	
Princes Iſland	06	30		109	16	
Bantam or Java	05	47		110	25	
Batavia	05	37		117	41	
Java Eaſt End	08	35		109	32	
Straits of Sundy	05	52		111	51	
Banca South End	03	25		118	06	
Borneo South point	04	14		131	51	
Bandy Iſles	05	05		131	51	
Celebes South end	06	00		122	41	
Celebes North end	01	40		126	44	
Mindano Weſt point	06	30		123	49	
Borneo North point	07	10		117	59	
Luconio *S* point	12	30	North Latitude	126	04	
Luconio *NE* point	18	35		124	19	
Anain W. point	19	30		113	20	
Anain E point	19	55		116	30	
Formoſa *S* point	22	00		124	44	
Formoſa *N.* point	25	32		125	39	
Piſcadore Iſles	23	30		122	49	
Iſlands Chuſan	30	38		125	49	
Japan *SE* point	39	50		140	29	
Japan *SW* point	39	10		132	00	

The Coaſt of America in the South Sea from Callifornia to *Cape* Horn.

Places Names	Latitude N, or S			Longit. E. or W		
	D	M		D	M	
Cape St Sebaſtian	42	30	North Latitude	124	41	Weſt Longitude
Cape St Lucio	23	25		106	42	
Cape Corientes	19	40		105	16	
Aquapulco	17	00		101	14	
Aquatulco	15	27		95	49	
Guatimala	14	25		99	46	
Panama	08	56		77	04	
Bay Bonaventuro	03	28	North Latitude	74	52	Weſt Longitude
Iſland of Gallopega	00	00		84	56	
Cape del Ajuga	16	38		83	36	
Cima	12	30		63	16	
Arica	18	12		68	56	
La Serena	24	40		71	18	
I Juan Fernando	33	20		81	34	
Baldivia	39	35		76	06	
Port Steven	46	50		77	22	
Cape Victory	52	15		78	06	
Cape Horn	57	58		74	41	

The Coaſt of Brazile in South America from *Cape* Horn to *Cape* Roque

Places Names	Latitude N, or S			Longit. E. or W		
MagellenE entrance	51	58	South Latitude	70	16	Weſt Longitude.
River Julian	48	40		69	18	
Cape Blanco near R. Comarones	46	50		66	51	
Buenos Aries *R* Plata	36	10		52	16	
River Grand	31	55		46	26	
St. Katherines	28	00		42	36	
Cape Frio	23	10		37	42	
Spirito Sancto	19	58		36	46	
P. Segura	16	22		35	44	
Bay Todus *S*anctus	13	00		35	21	
R *St* Franciſco	10	55		32	32	
Cape St Auguſtine	08	05		30	24	
Cape Roque	05	00		30	38	
Triſtian de Cunha	37	05		10	24	
Trinidada	03	30		24	46	

The Coaſt of the Main Continent in the Weſt Indies

Places Names	Latitude N, or S			Longit. E. or W		
R. Amazones Entr	00	00	North Latitude	43	46	Weſt Longitude
North Cape	02	05		44	41	
*S*urnnam	06	00		51	41	
Oronoque	08	15		53	51	
C Coquibaca	12	50		65	26	
Carthagena	10	50		70	36	
Scots *S*ettlement	08	30		73	31	
Nicaraque Entrance	11	15		29	51	
Cape Catacho	21	12		33	41	

Places Names	Latitude N or S D. M.	Longit. E. or W. D. M.
Campeche	19 20 N	87 51 W
La Vera Cruz	19 15 N	95 11 W
Eſcondide	18 20 N	93 46 W
Cape Florida	24 48 N	76 41 W
The Carribbe Iſlands		
	North Latitude	Weſt Longitude
Trinidada	10 05	54 51
Tobago	11 10	54 06
Granado	12 07	55 16
Barbadoes	13 10	52 49
St. Vincent	13 12	54 08
St. Lucia	13 52	54 03
Martinico	14 48	53 11
Dominico	15 35	53 13
Marigallante	15 53	53 06
Guardalupa	16 15	54 09
Monſerat	16 40	54 21
Antegoe	17 00	54 07
Nevis	17 06	55 04
St Chriſtophers	17 22	55 21
Barbuda	17 43	54 11
St Bartholomew	17 54	55 31
St Martins	18 05	55 25
Anguilla	18 13	55 41
Virgins	18 23	57 08
St Cruz	17 38	57 21
Bieque	18 00	58 01
PortoRico StJohns	18 33	59 06
StDomingoHiſpan.	18 15	63 36
P Royal Jamaica	18 00	71 49
Eaſt end of Cuba	20 20	68 51
Havana	22 50	78 16
Bay Honday	22 35	79 26
Cape St. Antonia	21 50	81 18
Bahama Iſlands		
Bermudas	32 30N	56 16 W
Bahama Bank N. Point	28 22N	73 01 W

Places Names	Latitude N or S D. M.	Longit. E or W. D. M.
	North Latitude	Weſt Longitude
Bahama Iſland	27 05	73 44
Abacco S. point	25 50	72 06
Harbour Iſland	25 40	71 21
Androſs N. point	25 15	73 46
Providence	25 00	72 31
Illathera S. point	24 36	70 43
Catt Iſland	24 25	70 06
Watling Iſland	24 07	69 36
Rum Key	23 45	69 51
Exuma	23 25	70 43
Crooked Iſle N. Point	23 03	68 46
Atkins Key	22 30	69 01
Moraparvouz	21 57	69 26
Atwood Keys	23 09	68 16
French Keys	22 40	68 21
Mayaguana	22 35	67 46
Hogſties	21 15	68 36
Hyneago	20 57	68 06
Cankcoſs Bank N. Point	21 50	66 01
Turks Iſland	21 35	64 54
Abrollo N. point	21 40	63 26
Plate wrack	20 03	62 56

The Coaſt of Carolina, Virginia, Maryland, Penſilvania, New England, and New-found-land.

	North Latitude	Weſt Longitude
Charles Town upon Aſhly Riv.	32 40	73 36
Cape Hateras	35 10	69 11
Cape Henry	37 00	69 16
Cape Charles	37 14	69 01
Cape Hinlopen	39 04	68 11
Long Iſland	40 50	65 26
New York	41 00	66 51

Cape

Places Names	Latitude North		Longit. West	
	D	M	D	M
	North Latitude		West Longitude	
Cape Cod	42	10	62	31
Boſton	42	35	63	36
Cape Sable	43	45	58	11
Iſland Sable	44	30	53	51
Cape Britain	46	20	53	06
Quebeck	47	05	64	36
Bay of Breſt	52	10	49	46
Bell Iſland	52	05	48	56
Cape St John	50	09	47	21
Cape Bonaviſta	49	11	46	49
Trinity Bay	48	27	49	41
Conception Bay	47	53	48	56
St. Johns Harbour	47	28	48	41
Bay of Bulls	47	40	49	32
Cape Race	46	30	48	11
Cape St Mary	47	10	48	06
Placentia	47	57	49	46
Cape Roy	48	21	52	01
The Coaſt of Hudſons-Bay, and the Straits.				
	North Latitude		West Longitude	
Suttons Iſles	60	05	64	36
Cape Charles	62	35	70	06
Cape Walſingham	63	05	72	26
Mansfield Iſle	62	20	70	16
Cape Jones	55	03	73	01
Ruperts River	51	16	73	41
Albany River	52	32	77	51
The Cubbs	54	18	77	36
C. Henrietta Maria	55	06	77	48
Port Nelſon	57	05	87	36
Cape Churchil	59	00	87	43
C. Southampton	61	57	83	16
Shark Point	64	27	78	06
Nottingham Iſle	63	38	74	32
Q. Anns Foreland	63	32	69	37
Reſolution Iſle	61	55	59	36
Cape Farewell	59	10	41	31

Places Names	Latitude North		Longit. West	
The Coaſt of Iceland, Greenland, Nova Zembla, and the Northern Iſles.				
	D	M	D	M
	North Latitude		West Longitude	
Sound Royal	66	22	19	29
Bargazar Point	66	30	16	26
Whales Back	65	27	15	19
Merch Foreland	63	20	19	19
Halliford	64	30	29	29
Fair Foreland	65	10	31	59
Grims Iſland	66	51	22	59
Weſtmania Iſles	63	51	23	24
Iſles of Fero	62	06	10	14
Beerenberg, or John Mains Iſle	71	45	09	44
	North Latitude		East Longitude	
Point Lookout	76	40	21	39
Horn Sound	77	23	19	34
Fair Foreland	79	18	16	04
Hacluits Headland	79	55	17	14
Helies Sound	79	15	17	19
Lees Foreland	78	05	28	39
Whales head	77	18	26	44
Hope Iſland	76	22	27	14
Cherry or Bear Iſle	74	35	23	19
Admiralty Iſland	75	05	65	04
Fretum borough	69	55	67	19
Cape Candenoſe	69	27	47	44
Catnoſe	65	43	40	28
Archangel Bar	65	05	40	44
Croſs Iſland	66	31	41	47
Sweetnoſe	68	08	39	56
Kilduyn	69	32	35	29
North Cape	71	25	27	14
Surroy	71	05	21	54
Tromſound	70	18	21	14
Loefort SW point	67	47	14	49
Dronton	64	00	15	54
Standland	62	10	09	52
North bergen	60	16	10	54
Naze of Norway	57	50	12	36

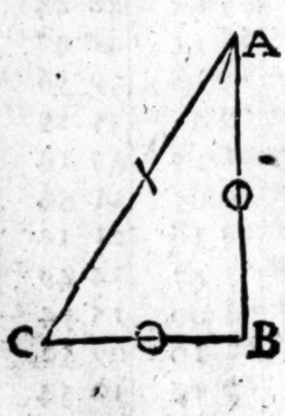
Places Names	Latitude N or S		Longit. E or W.		Places Names	Latitude N or S		Longit. E or W	
Sea Coaſt in the Sound, & Baltick Sea.	D	M	D	M.		D	M	D	M
	North Latitude		Weſt Longitude			North Latitude		Eaſt Longitude.	
Mordou	58	25	14	19	Revel	59	00	29	59
Larwick	58	54	14	34	Riga	56	50	30	04
Chriſtiana	59	10	14	59	Derwinda	57	20	27	14
Maeſterland	57	58	16	59	Coningsberg	55	00	25	44
Gottenberg	57	33	17	39	Dantzick	54	22	24	14
Elſinor	56	00	17	46	Wisby in Gotland	57	37	24	04
Copenhagen	55	44	17	49	Bornholm	55	27	20	07
Valſteborn	55	20	18	09	Straelſound	54	45	18	34
Kalmer	56	40	21	54	Dubeck	54	25	16	19
Stockholm	59	20	23	39	Anout	56	42	16	12
Wyborg	60	20	34	40	Leſou	57	05	15	54
Petersberg	59	25	35	04	Scaw	57	26	15	24
Narve	58	39	33	28					

Problems of Plain Sailing, wrought by the Logarithms, *and by* Gunter's Scale.

PROBLEM. I.

THE Courſe and Diſtance being given; to find the Difference of Latitude and Departuee.

Example. Suppoſe a Ship ſails South Weſt by South, 382 Minutes, and it be required to find the Difference of Latitude and Departure.



In the Triangle A B C.

AC repreſents the Diſtance ſailed.
AB the Difference of Latitude.
BC the Departure.
BAC (or the Angle at A) the Angle of the Courſe
ACB (or the Angle at C) the Complement of the Courſe to 90°

Charac-

Characters uſed in Navigation *and* Aſtronomy.

S. ſtand for Sine.
T. for Tangent.
Sc. Sine Complement. Tc. Tangent Complement.
The given Sides and Angles of a Triangle are marked with a Daſh thus (′)
The required Sides and Angles with a Cypher thus (°)

The Operation by the Logarithms. *For the Difference of Latitude.*

As Radius	10.000000
To the Diſtance ſailed 382 Minutes	2.582063
So is Sc. of the Courſe 56° 15′	9.919846
To the Difference of Latitude 317 Minutes $\frac{2}{10}$	$\cancel{1}2.501909$

For the Departure.

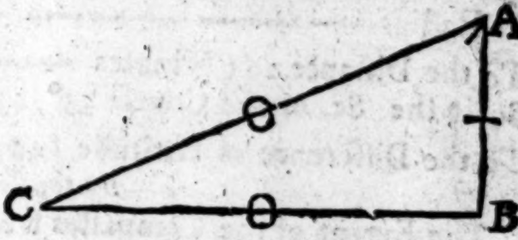
As Radius	10.000000
To the Diſtance ſailed 382 Minutes	2.582063
So is the S of the Courſe 33° 45′	9.744739
To the Departure, 212 Minutes $\frac{2}{10}$	$\cancel{1}2.326802$

The Operation by Gunter*'s* Scale.

One Foot of the Compaſſes being in the Radius, or S of 8 Points, extend the other to the Diſtance 382 Minutes, the ſame Extent laid from S. Crs. 3 Points will reach to 212 Minutes the Departure from the Meridian, and the Compaſſes kept at the ſame Diſtance will reach from the Sc. Crs. 5 Points to 318 Minutes, the Difference of Latitude as above.

PROB. II. The Courſe and Difference of Latitude given, to find the Diſtance and Departure.

Suppoſe a Ship ſail W. S. W. until the Difference of Latitude be 219 Leagues, and the Diſtance and Departure required.



The Operation by the Logarithms. *For the Diſtance.*

As Sc. of the Courſe 22° 30′	9.582840
To the Difference of Latitude 219 Leagues	2.340444
So is Radius	10.000000
To the Dſtance which is 572 $\frac{2}{10}$ Leagues	2.757604

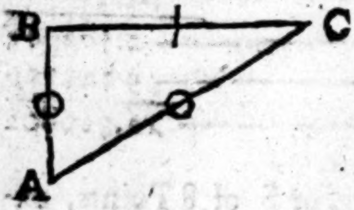
For the Departure.

As the Radius —————————— 10.000000
To the Diſtance 527,$\frac{3}{0}$ Leagues found before ——— 2.757604
So is the Sine of the Courſe 67° 30′ ——————— 9.965615
To the Departure 528,$\frac{3}{0}$ Leagues ———————— $\cancel{1}$2.723219

By the Gunter.

The Compaſſes being extended from the S. of 2 Points, the Complement of the Courſe to 219 Leagues, the Difference of Latitude; will reach from Radius S. 8 Points, to 572 Leagues the Diſtance, and the ſame Extent of the Compaſſes from the S. to the Courſe 6 Points, ſhall reach to 529 Leagues, the Departure.

PROB. III. The Courſe and Departure given, to find the Diſtance and Difference of Latitude.



Suppoſe a Ship ſail North Eaſt by Eaſt, until her Departure be 220 Minutes, the Diſtance and Difference of Latitude required.

By the Logarithms. For the Diſtance.

As the S. of the Courſe 56° 15′ ———————— 9.919846
To the Departure 220 Minutes ———————— 2.342423
So is the Radius —————————— 10-000000
To the Diſtance 265 Minutes ——————— $\cancel{1}$2,422577

For the Difference of Latitude.

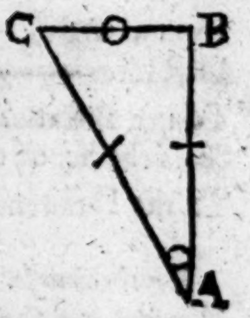
As Radius —————————————— 10.000000
To the Diſtance 265 Minutes ———————— 2.423246
So is the Sc. of the Courſe 33° 45′ —————— 9.744739
To the Difference of Latitude 147 Minutes ——— $\cancel{1}$2.167985

By the Gunter.

The Extent of the Compaſſes from the S of the Courſe 5 Points, to the Departure 220 Minutes, will reach from Radius S of 8 Points to the Diſtance, and the ſame Extent of the Compaſſes from S. 3 points the Complement of the Courſe, ſhall reach to the Difference of Latitude 147 Minutes as above.

PROB. IV. The Diſtance and Difference of Latitude given, to find the Courſe and Departure.

Sup-



Suppoſe a Ship ſail between the North and the Weſt 206 Miles until the Difference of Latitude be 197 Miles, the Courſe and Departure required.

By the Logarithms. *For the Courſe*

As the Diſtance 206 Miles	2.313867
To the Radius	10.000000
So is the Difference of Latitude 197 Miles	2.294466
To the Sc. of the Courſe ; which is N. 17° 00′ W	9.980599

For the Departure

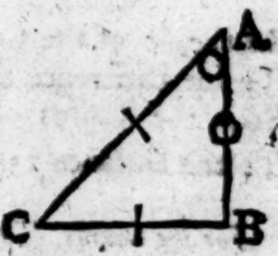
As Radius	10.000000
To the Diſtance 206 Miles	2.313867
So is the S. of the Courſe 17° 00′	9.465635
To the Departure 60 Miles	1.779802

By the Gunter.

For the Courſe. The Extent from the Diſtance 206 Miles, to the Difference of Latitude 197 Miles, ſhall reach from Radius S. 90 deg. to the Sine of 73 deg. 00 min. the Complement of the Courſe, which ſubtracted from 90d. is 17 deg. 00 min. the Courſe N. Weſterly or N by W ½ W.

For the Departure. The Extent from Radius S. 90 deg. to the Sine of the Courſe 17 deg. 00 min. ſhall reach from the Diſtance 206 Minutes to the Departure 60 Minutes as above.

PROB V. The Diſtance and Departure given, to find the Courſe and Difference of Latitude.



Suppoſe a Ship ſails between the South and the Weſt 247 Minutes, until the Departure be 197 Minutes, and it be required to find the Courſe and Difference of Latitude.

The Operation by the Logarithms. *For the Courſe.*

As the Diſtance 247 Minutes	2.392697
To Radius	10.000000
So is the Departure 197 Minutes	2.294466
To the Sine of the Courſe 52 deg. 54 min. Weſterly	9.901769

For the Difference of Latitude.

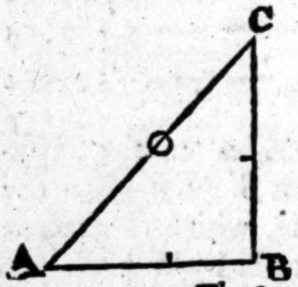
As Radius — — — — — — — 10.000000
To the Diſtance 247 Minutes — — — — — 2.392697
So is the Sc. of the Courſe 52 deg 54 min. — — — 9.780467
To the Difference of Latitude 149 Minutes — — — 12.173164

By the Gunter.

For the Courſe. The Extent of the Compaſſes from the Diſtance 247 Minutes, to the Departure 197 Minuees, ſhall reach the ſame way from Radius S. 90 deg. to the S. of the Courſe, 52 deg. 54 min. South Weſterly, or South Weſt ¾ Weſt.

For the Difference of Latitude. The Extent from Radius S. 90deg. to the S. 37 deg. 06 min. the Complement of the Courſe, will reach the ſame way from the Diſtance 247 Min. to the Difference of Latitude, 149 Minutes

PROB. VI. The Difference of Latitude and Departure given, to find the Courſe and Diſtance.



Suppoſe a Ship ſail between the South and Weſt until her Difference of Latitude be 174 Leagues, her Departure 200 Leagues, and it be required to find the Courſe and Diſtance.

The Operation by the Logarithms. *For the Courſe.*

As the Difference of Latitude 154 Leagues — — — 2.187521
To Radius — — — — — — 10.000000
So is the Departure 200 Leagues — — — — 2.301030
To the Tang. of the Courſe 52 deg. 24 min. South Weſterly — 10.113509

For the Diſtance.

As the Sc. of the Courſe 52 deg. 24 min. — — — 9.785433
To the Difference of Latitude 154 Leagues — — — 2.187521
So is the Radius — — — — — — 10.000000
To the Diſtance 252 Leagues — — — — — 2.402088

By the Gunter.

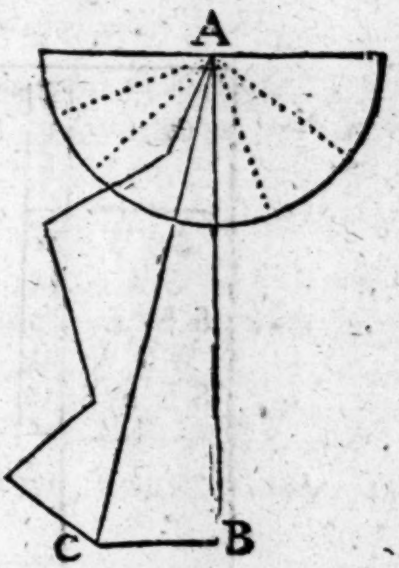
For the Courſe. The Extent of the Compaſſes from the Difference of Latitude, 154 Leagues, to the Departure 200 Leagues, ſhall reach from Radius Tangent of 45 deg. to the Tang. of the Courſe, 52 deg. 24 min. South Weſterly, or South Weſt ¾ Weſt.

For the Diſtance. The Extent from the S. of 37 deg. 36 min. the Complement of the Courſe to the Radius, or the S. of 90 deg. will reach from the Difference of Latitude 154 Leagues, to the Diſtance 252 Leagues.

PROB.

PROB. VII.

This Problem ſhews the manner of working a Traverſe, and is very uſeful in keeping a Reckoning by Plain Sailing.



Example.

Suppoſe a Ship bound to a certain Port, and ſhe ſails firſt S S W. 40 min. then S. W. 60 min. then S. by E. 63 min. Weſt 49 min. then SE. by S. 56 min. and the Difference of Latitude and Departure the Ship hath made, with the direct Courſe and Diſtance is required.

The Operation by the Logarithms

For the Difference of Latitude for the firſt Courſe.

As Radius ——————————— 10.000000
To the Diſtance 40 min. ——————————— 1.602060
So is the Sc. of the Courſe 22° 30′ ——————————— 9.965615
To the Difference of Latitude 36 min. $\frac{9}{10}$ ——————————— $\cancel{1}1.567675$

For the Departure of the firſt Courſe

As Radius ——————————— 10.000000
To the Diſtance 40 min. ——————————— 1.602060
So is S. of the Courſe 22° 30′ ——————————— 9.582839
To the Departure 16 min. $\frac{3}{10}$ ——————————— $\cancel{1}1.184899$

By the Gunter.

The Extent of the Compaſſes from Radius the S. of 8 Points, to the Diſtance 40 min. that Extent in the Compaſſes laid from the Sine of the Courſe 2 Points will reach to 16 min. $\frac{3}{10}$ the Departure, and the Compaſſes being kept to the ſame Extent, and laid from Sine 6 Points the Complement of the Courſe will reach to 36 min. $\frac{9}{10}$ the Difference of Latitude.

In the ſame manner proceed to find the Difference of Latitude and Departure for each Courſe and Diſtance; which being found, place in a Table as follows.

A Traverſe Table.

Courſe	Diſtances	*North*	*South*	*Eaſt*	*Weſt*
S S W	40		36.9		15.3
S W	60		42.4		42.4
S by E	63		61.8	12.3	
W S W	49		19.7		45.3
S E by S	56		43.6	31.1	
		Diff. Lat.	205.3	43.4	103.0
					43.4
				Dep.	59.6

The Explanation of the Table.

For the placing the Difference of Latitude and Departure in their proper Columns, obſerve, that if the Courſe be Northerly the Difference of Latitude is put in the North Column; if it be Southerly in the South Column; and if the Courſe be Eaſterly, the Departure is put in the Eaſt Column; if Weſterly in the Weſt Column.

Thus having framed the Table, add up the North, South, Eaſt, and Weſt Columns ſeverally, whereby the Difference of Latitude appears to be 205$\frac{3}{10}$ Minutes South, becauſe there is nothing in the North Column; the Departure 59$\frac{6}{10}$ Minutes Weſt, becauſe ſo much the Weſt Column exceeds the Eaſt: By which Difference of Latitude and Departure, find the Direct Courſe and Diſtance as follows.

The Operation by the Logarithms. *For the direct Courſe.*

As the Difference of Latitude 205 min. $\frac{3}{10}$ ———— 2.311754
To the Radius ———— 10 000000
So is the Departure 59 min. $\frac{6}{10}$ ———— 1.770852
To the T. of the Courſe 16° 3′ South Weſterly becauſe the South and Weſt Columns exceed the North and Eaſt } 9.459098

For the Diſtance.

As the Sc. of the Courſe 16° 3′ ———— 9.982733
To the Difference of Latitude 205 min. $\frac{3}{10}$ ———— 2.311754
So is Radius ———— 10.000000
To the Diſtance required 213 Minutes ———— 2.329021

By the Gunter. *For the direct Courſe:*

The Extent of the Compaſſes from the Difference of Latitude 205 min. the Departure 59 min. ſhall reach from the Tangent of 45° (or Radius) to the Tangent of 16° 3′ the Courſe required.

For the Diſtance.

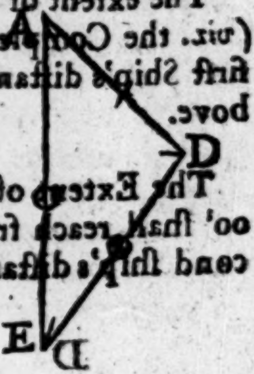
The Extent from S. 73 deg. 57 min. the Complement of the Courſe, to S. 90 deg. *viz.* Radius, ſhall reach from the Difference of Latitude 205 min. to the Diſtance 213 Minutes.

Oblique angled Plain Triangles, applied in PROBLEMS *of* Plain-Sailing, *and wrought by the* Logarithms, *and* Gunter's-Scale.

PROB. I. THE Angles and one of the ſides given, to find either of the other ſides.

Example.

Suppoſe there are two Ports both under one Meridian, a Ship ſails from the Northermoſt S. E. 206 Miles, another Ship ſails from the ſouthermoſt North Eaſt by North, a certain number of Miles, and meets with the firſt ſhip: the diſtance between theſe two Ports, and the diſtance ſailed by the ſecond ſhip is required.



In the Triangle A D E.

A and E repreſents the two Ports, AD the firſt ſhip's diſtance. ED the ſecond ſhip's diſtance. AE the diſtance between the two Ports.

The Operation by the Logarithms. *For the Diſtance between the two Ports.*

As S. AED 33° 45′ ——————— Co. Ar. 0.255261
To AD the firſt ſhips Diſtance 206 min. ————— 2.313867
So is S. ADE [illegible] which ſubtract from 180 deg. ———— 9.991753
To AE the diſtance between the two Ports 364 min ——— 2.560701

In all Operations where Radius is not one of the three given Terms, to ſave the labour of ſubtracting the firſt Logarithm from the Sum of the ſecond and third, uſe the Complement Arithmetical of the firſt Logarithm, which is found by ſubtracting each figure of the Logarithm from 9, except the firſt towards the Right-hand, which is ſubtracted from 10, as in the Operation, the Logarithm Sine found in the Table is 9.744739, wherefore beginning at the Left-hand ſay, 9 from 9 there remains 0; 7 from 9 remains 2; 4 from 9, there remains 5; 4 from 9, there remains 5; 7 from 9 remains 2; 3 from 9, there remains 6; 9 from 10, there remains 1. So the Complement Arithmetical of the firſt Logarithm, is 0.255261, which added to the other two Logarithms, and from the Sum abate Radius, the Remainder is the Logarithm, Sine, or Tangent required.

And *Note*, to find the Sine of any degree and minute above 90°, ſubtract the degree and minute from 180° the Sine of the Remainder is the Sine required.

For the ſecond Ship's Diſtance.

As S. AED 33° 45′ ———— ———— ———— ———— Co. Ar.	0.255261
To AD the firſt ſhip's Diſtance 206 min. ——— ———— ————	2.313867
So is S. DAE 45° 00′ ———— ———— ——— ———— ————	9.849485
To DE the ſecond ſhips diſtance, 262 minutes ———— ————	12.418613

By the Gunter. *For the Diſtance between the two Ports.*

The extent of the Compaſſes from S of 33° 45′ to the S. ADE, 78° 45′ (*viz.* the Complement of 101° 15′ to 180°) ſhall reach from 206 min. the firſt Ship's diſtance, to 364 min. the Diſtance between the two Ports as above.

For the ſecond Ships Diſtance.

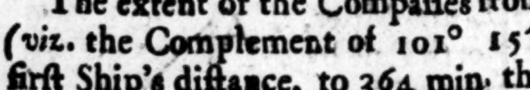
The Extent of the Compaſſes from the S. of 33° 45′ to the S. of 45° 00′ ſhall reach from 206 min. the firſt ſhips diſtance, to 262 min. the ſecond ſhip's diſtance required.

PROB. II.

Two ſides and an Angle oppoſite to one of them being given, to find the other oppoſite Angle and the third ſide.

Example.

Suppoſe two Ports, whoſe Bearing is North Eaſt and South Weſt diſtant 396 Miles, a ſhip at the Northermoſt ſails South South Eaſt, and another Ship at the ſouthermoſt ſails thence 518 Miles, and meets with the firſt Ship: The Courſe ſailed by the ſecond ſhip, and the firſt ſhips diſtance are required.



In the Triangle ADE.

A repreſents the Southermoſt Port, D the Northermoſt
AD the Diſtance between the two Ports.
DE the Courſe and Diſtance ſailed by the firſt Ship
AE the Courſe and Diſtance ſailed by the ſecond Ship

The Operation by the Logarithms. *For the ſecond Ships Courſe.*

As AE the ſecond Ship's diſtance 518 min. ——— Co. Ar. 7.285671
To S. ADE 67° 30' ——— 9.965615
So is AD the Diſtance between the two Ports 396 min. ——— 2.597695
To S. AED 44° 56' ——— 19.848981

The Angle at D 67° 30′ and the Angle at E 44° 56′ being added together and ſubtracted from 180° gives 67° 34′, the Angle at A, which makes neareſt 6 Points, and 6 Points reckoned from the North Eaſt to the ſouthward gives ESE. the ſecond Ship's Courſe required.

For the firſt Ship's Diſtance.

As S. ADE 67° 30′ ——— Co. Ar. 0.034384
To AE the ſecond ſhips diſtance 518 min. ——— 2.714329
So is S. DAE 67° 34′ ——— 9.965824
To DE the firſt Ship's diſtance 518 min. ——— 12.714537

By the Gunter.

The Extent of the Compaſſes from 518 min. to S. 67° 30′ ſhall reach from 396 min. to S. 44d. 56m. which added to the Angle at D, and the Sum ſubtracted from 180d. gives 67° 30′ the Angle at A as above.

For the firſt Ships Diſtance. The Extent from S. 67d. 30m. to 518 min. will reach from S. 67d. 34m. to 518 min. the Ship's Diſtance as above.

PROB. III.

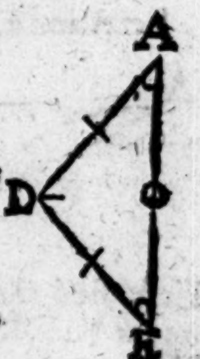
Two ſides and the contained Angle given to find the other Angle.

Example

Suppoſe two ſhips ſail from one Port; one ſails N. E. 140 Miles, the other South Eaſt by Eaſt 115 Miles, the Bearing and Diſtance of theſe two Ships is required.

Let D repreſent the Port, DA the firſt Ships Diſtance, and DE the ſecond

Miles
140
115
Sum 255
Diff. 25



The Operation by the Logarithms. *For the Bearing of the two Ships.*

As the Sum of the Sides AD and DE 255 min. ——— Co. Ar. 7.593459
To the Difference of the ſaid ſides 25 min. ——— 1.397940
So is the T. of half the Sum of their oppoſite Angles 50° 37′ ——— 10.085698

To the T. of half their Difference, which is 6d. 48m. ——— ~~1~~9.077097

The half Difference added to the half Sum, gives 57° 25′, the greater Angle AED. The half Difference ſubtracted from it, gives 43° 49′, the leſſer Angle DAE. Wherefore the Bearing of the two Ships is N.E.erly or South-Weſterly 1° 11′.

For the Diſtance of the two Ships.

As S. AED 57 deg. 25 min. ——— Co. Ar. 0.074373
To AD the firſt Ships diſtance 140 min. ——— 2.146128
So is S. ADE 78 deg. 45 min. ——— 9.991573

To AE the diſtance of the Ships, 163 min. ——— ~~1~~2.212074

By the Gunter. *For the Bearing of the Ships*

The extent of the Compaſſes from the ſum of the ſides, 255m. to their Difference 25 min. ſhall reach from the T. of the half ſum of the required Angles 50° 37′ to the T. of half their Difference of the ſaid Angles 6° 48′.

In the foregoing Operation by the *Gunter*, the Practitioner may be at a Loſs, becauſe in extending the Compaſſes from the T. 50° 37′ decreaſing, it will fall beyond the T. of 45 deg. at the End of the Line. To remedy this, place the extent from 255 to 25, from the T. 45d. and it will reach to T. of 50° 37′, then letting one Point ſtand at 45° extend the other to the T. 50° 37′ this extent place from the T. of 45°, ſhall fall on the T. 6° 48′ required.

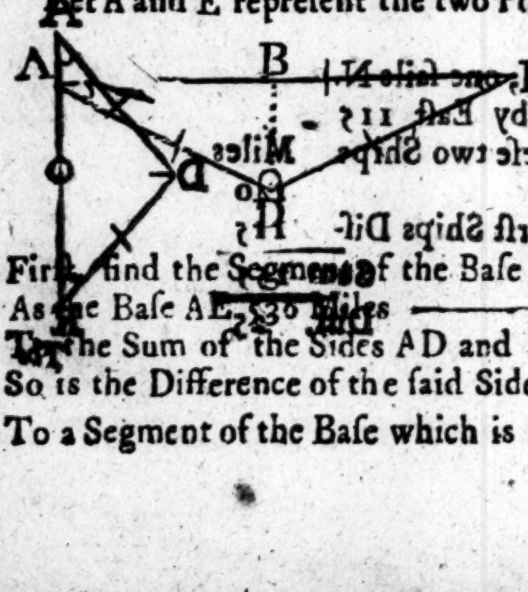
For the Diſtance of the Ships.

The Extent from the Sine of 57 d. 25 m. to the Side 140 ſhall reach from [illegible] 163 [illegible]

PROB. IV. Three ſides being given to find an Angle.

Example. Suppoſe there are two Ports both in one Latitude, diſtant 536 Miles; a Ship ſails from the Eaſtermoſt 306 Miles between the South and the Weſt: Another ſhip ſails from the Weſtermoſt 290 Miles, and meets with the firſt Ship; the Course of each Ship is requir'd.

Let A and E repreſent the two Ports, D the Place where the Ships meet.



This Queſtion is reſolved by letting fall a Perpendicular DB, reducing the Oblique Triangle ADE into two Right-angled Triangles ABD and BDE, then the Operation

Firſt, find the Segment of the Baſe BE, thus.

As the Baſe AE 536 Miles ——— Co. Ar. 7.270835
To the Sum of the Sides AD and ED 596 Miles ——— 2.775246
So is the Difference of the ſaid Sides 16 Miles ——— 1.204120

To a Segment of the Baſe which is 18 Miles ——— ~~1~~1.250201

The whole Baſe is ———————— 536 min.
The Difference of the Segment is ———— 18
Sum is ———————— 554
Half Sum ———————— 277 the greater Segment BE

Then ſay, *For the firſt Ships Courſe.*

As DE the firſt Ship's Diſtance 306 min. ———— 2.485721
To Radius ———————— 10.000000
So is the greater Segment BE 277 min. ———— 2.442479
To Sc. BED 25° 9′ ———————— 9.956758

The Angle at E is the Courſe from the Weſt ſoutherly, ſo the firſt ſhip ſteers South 64° 51′ Weſt, or SW by W. three quarters W. almoſt.

For the ſecond Ship's Courſe.

As AD the ſecond Ship's Diſtance 290 min. ———— Co. Ar. 7.537602
To Sine ADE 25° 9′ ———————— 9.628378
So is DE the firſt Ship's diſtance 306 ———— 2.485721
To Sine DAE 26° 39′ ———————— 19.651701

The Angle at A is the Courſe from the Eaſt ſoutherly, ſo the ſecond ſhip ſteers South 63 deg 21 min. Eaſt or S by E half E.

By the Gunter. *For the Difference of Segments of the Baſe.*

The extent of the Compaſſes from the Baſe AE 506 min. to the ſum of the ſides 596 min. ſhall reach from the Difference of the ſides 16, to the Difference of Segments of the Baſe 18 min. with which proceed as before.

For the firſt Ships Courſe.

The extent from the Diſtance 306 min. to the greater Segment 277 min ſhall reach from Radius or Sine 90 deg. to Sine 64 deg. 51 min. the Complement of BED 25 deg. 9 min. required.

For the ſecond Ship's Courſe.

The extent from 290 min. the ſecond ſhip's diſtance, to 306 min. the firſt Ship's diſtance, ſhall reach from the Sine 25 deg. 9 min. to the Sine 26 deg. 39 min. the Angle at A required.

PROB. V.

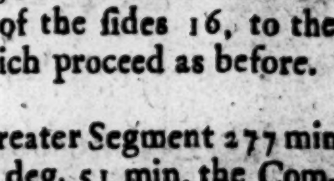
Two ſides and their contained Angle given, to find the third ſide.

Example.

Two ſhips ſail from one Port at A; the firſt ſails Eaſt 335 Miles to B, the ſecond ſails Eaſt 14 deg. 40 min. North, 271 Miles to C. I demand how far they are aſunder, and what is the Courſe from the Ship at C, to that at B.

In the Triangle ABC,
There is given,

AB 335 }
AC 271 } BC required
ABC 14° 40′ }



This Caſe requires a double Operation
1. By the 3*d* Caſe to find the Angles
2. By the 1*ſt* Caſe to find the Side required

AC 335
AL 271
Sum is 606
Diff. is 64

The firſt Operation

As the Sum of the Sides AB and AC 606 Miles —— Co. Ar. —— 7.217528
To their Difference —— 64 —— 1.806180
So is t. of half Sum Angles —— 82° 40′ —— 10.890440
To t. half their Difference —— 39 22 —— ~~1~~9.914148

By which you will find the Angle ABC, to be 43° 18′.

The ſecond Operation.

As S. ABC 43d. 18 Miles —— Co. Ar. 0.163791
To the Side AC 271 Miles —— 2.432969
So is S. BAC 14 deg. 40 min. —— 9.403455
To Side BC 100 Miles —— ~~1~~2.000215

The Angle at B is found to be 43 deg. 18 min. therefore the Line AB being Eaſt and Weſt, the Courſe from C to B is Eaſt 43 deg. 18 min. S or S E. 1 deg. 42 min. Eaſterly. And the Diſtance 100 Miles.

By the Gunter, *for the Angle at* B.

The extent from 606 Miles the ſum of the ſides, To 64 Miles the Difference of the Sides, will reach from the Tang. of 82d. 40m. half the Sum of the unknown Angles; to the Tangent of 39 deg. 22 min. half their Difference, which being found, proceed as above to find the Angle at B.

Then the Extent from S. 43d. 18m. the Angle at B, to S. 14 deg. 40 min the Angle at A; will reach from 271 Miles the ſide AC, to 100 Miles ſide BC, as above

Thus much for ſailing by the *Plain Chart*; which being of ſome Uſe in ſhort Voyages, and a good Foundation for further Improvement, we were not willing wholly to omit it; but nevertheleſs would adviſe all that take Charge of Ships never to content themſelves with the Uſe of the *Plain Chart* only, being ſo apparently falſe in it ſelf, and ſo unſafe for Practice: Nor are we under any Neceſſity to truſt to it, the Defect thereof being now ſufficiently ſupplied by Mr. *Wright*'s True Chart, commonly called *Mercator*'s, the Projection and Uſe of which (both in ſingle Queſtions and Traverſes) is largely treated of and rendered as eaſy as the *Plain Chart*, in the Book called *Practical Navigation*, firſt ſet forth by Mr. *John Seller*, and now Corrected and Reprinted for Mr. *Page* and *Mount* on *Tower-hill*, with many uſeful Additions.

4 FEB 57

A Large and very Uſeful

TABLE
OF
DIFFERENCE
OF
LATITUDE and DEPARTURE
IN
Minutes and Tenth Parts,
to every *Degree* and *Quarter-Point*
OF THE
COMPASS:
For the Exact Working
OF A
TRAVERSE

LONDON: Printed for *Thomas Page* and *William Mount*, at the *Poſtern* on *Tower-Hill*.

Dist.	1 Deg.		2 Deg		¼ point		3 Deg.		4 Deg.		5 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Deb	Lat	Dep	
1	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.1	01.0	00.1	01.0	00.1	1
2	02.0	00.0	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.2	2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3	3
4	04.0	00.1	04.0	00.1	04.0	00.2	04.0	00.2	04.0	00.3	04.0	00.3	4
5	05.0	00.1	05.0	00.2	05.0	00.2	05.0	00.3	05.0	00.3	05.0	00.4	5
6	06.0	00.1	06.0	00.2	06.0	00.3	06.0	00.3	06.0	00.4	06.0	00.5	6
7	07.0	00.1	07.0	00.2	07.0	00.3	07.0	00.4	07.0	00.5	07.0	00.6	7
8	08.0	00.1	08.0	00.3	08.0	00.4	08.0	00.4	08.0	00.6	08.0	00.7	8
9	09.0	00.2	09.0	00.3	09.0	00.4	09.0	00.5	09.0	00.6	09.0	00.8	9
10	10.0	00.2	10.0	00.4	10.0	00.5	10.0	00.5	10.0	00.7	10.0	00.9	10
11	11.0	00.2	11.0	00.4	11.0	00.5	11.0	00.6	11.0	00.8	11.0	01.0	11
12	12.0	00.2	12.0	00.4	12.0	00.6	12.0	00.6	12.0	00.8	12.0	01.0	12
13	13.0	00.2	13.0	00.5	13.0	00.6	13.0	00.7	13.0	00.9	12.9	01.1	13
14	14.0	00.2	14.0	00.5	14.0	00.7	14.0	00.7	14.0	01.0	13.9	01.2	14
15	15.0	00.3	15.0	00.5	15.0	00.7	15.0	00.8	15.0	01.0	14.9	01.3	15
16	16.0	00.3	16.0	00.6	16.0	00.8	16.0	00.8	16.0	01.1	15.9	01.4	16
17	17.0	00.3	17.0	00.6	17.0	00.8	17.0	00.9	17.0	01.2	16.9	01.5	17
18	18.0	00.3	18.0	00.6	18.0	00.9	18.0	00.9	18.0	01.3	17.9	01.6	18
19	19.0	00.3	19.0	00.7	19.0	00.9	19.0	01.0	19.0	01.3	18.9	01.7	19
20	20.0	00.4	20.0	00.7	20.0	01.0	20.0	01.0	20.0	01.4	19.9	01.7	20
21	21.0	00.4	21.0	00.7	21.0	01.0	21.0	01.1	20.9	01.5	20.9	01.8	21
22	22.0	00.4	22.0	00.8	22.0	01.1	22.0	01.1	21.9	01.5	21.9	01.9	22
23	23.0	00.4	23.0	00.8	23.0	01.1	23.0	01.2	22.9	01.6	22.9	02.0	23
24	24.0	00.4	24.0	00.8	24.0	01.2	24.0	01.3	23.9	01.7	23.9	02.1	24
25	25.0	00.4	25.0	00.9	25.0	01.2	25.0	01.3	24.9	01.7	24.9	02.2	25
26	26.0	00.5	26.0	00.9	26.0	01.3	26.0	01.4	25.9	01.8	25.9	02.3	26
27	27.0	00.5	27.0	00.9	27.0	01.3	27.0	01.4	26.9	01.9	26.9	02.4	27
28	28.0	00.5	28.0	01.0	28.0	01.4	28.0	01.5	27.9	02.0	27.9	02.4	28
29	29.0	00.5	29.0	01.0	29.0	01.4	29.0	01.5	28.9	02.0	28.9	02.5	29
30	30.0	00.5	30.0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02.6	30
31	31.0	00.5	31.0	01.1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7	31
32	32.0	00.6	32.0	01.1	32.0	01.6	32.0	01.7	31.9	02.2	31.9	02.8	32
33	33.0	00.6	33.0	01.2	33.0	01.6	33.0	01.7	32.9	02.3	32.9	02.9	33
34	34.0	00.6	34.0	01.2	34.0	01.7	34.0	01.8	33.9	02.4	33.9	03.0	34
35	35.0	00.6	35.0	01.2	35.0	01.7	35.0	01.8	34.9	02.4	34.9	03.1	35
36	36.0	00.6	36.0	01.3	36.0	01.8	35.9	01.9	35.9	02.5	35.9	03.1	36
37	37.0	00.6	37.0	01.3	37.0	01.8	36.9	01.9	36.9	02.6	36.9	03.2	37
38	38.0	00.7	38.0	01.3	38.0	01.9	37.9	02.0	37.9	02.7	37.9	03.3	38
39	39.0	00.7	39.0	01.4	39.0	01.9	38.9	02.0	38.9	02.7	38.9	03.4	39
40	40.0	00.7	40.0	01.4	40.0	02.0	39.9	02.1	39.9	02.8	39.8	03.5	40
41	41.0	00.7	41.0	01.4	41.0	02.0	40.9	02.1	40.9	02.9	40.8	03.6	41
42	42.0	00.7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7	42
43	43.0	00.8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.8	43
44	44.0	00.8	44.0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8	44
45	45.0	00.8	45.0	01.6	44.9	02.2	44.9	02.4	44.9	03.1	44.8	03.9	45
46	46.0	00.8	46.0	01.6	45.9	02.3	45.9	02.4	45.9	03.2	45.8	04.0	46
47	47.0	00.8	47.0	01.6	46.9	02.3	46.9	02.5	46.9	03.3	46.8	04.1	47
48	48.0	00.8	48.0	01.7	47.9	02.4	47.9	02.5	47.9	03.4	47.8	04.2	48
49	49.0	00.9	49.0	01.7	48.9	02.4	48.9	02.6	48.9	03.4	48.8	04.3	49
50	50.0	00.9	50.0	01.7	49.9	02.5	49.9	02.6	49.9	03.5	49.8	04.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	89 Deg.		88 Deg.		7¾ point		87 Deg.		86 Deg.		85 Deg.		

136
451

5-0-6
4640
3-26
60

206
69

4 FEB 59

Dist.	1 Deg.		2 Deg.		¼ Point		3 Deg.		4 Deg		5 Deg.		Dist.
	Lat.	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
51	51.0	00.9	51.0	01.8	50.9	02.5	50.9	02.7	50.9	03.6	50.8	04.4	51
52	52.0	00.9	52.0	01.8	51.9	02.6	51.9	02.7	51.9	03.6	51.8	04.5	52
53	53.0	00.9	53.0	01.8	52.9	02.6	52.9	02.8	52.9	03.7	52.8	04.6	53
54	54.0	00.9	54.0	01.9	53.9	02.7	53.9	02.8	53.9	03.8	53.8	04.7	54
55	55.0	01.0	55.0	01.9	54.9	02.7	54.9	02.9	54.9	03.8	54.8	04.8	55
56	56.0	01.0	56.0	02.0	55.9	02.7	55.9	02.9	55.9	03.9	55.8	04.9	56
57	57.0	01.0	57.0	02.0	56.9	02.8	56.9	03.0	56.9	04.0	56.8	05.0	57
58	58.0	01.0	58.0	02.0	57.9	02.8	57.9	03.0	57.9	04.0	57.8	05.1	58
59	59.0	01.0	59.0	02.1	58.9	02.9	58.9	03.1	58.9	04.1	58.8	05.1	59
60	60.0	01.1	60.0	02.1	59.9	02.9	59.9	03.1	59.9	04.2	59.8	05.2	60
61	61.0	01.1	61.0	02.1	60.9	03.0	60.9	03.2	60.9	04.3	60.8	05.3	61
62	62.0	01.1	62.0	02.2	61.9	03.0	61.9	03.2	61.9	04.3	61.8	05.4	62
63	63.0	01.1	63.0	02.2	62.9	03.1	62.9	03.3	62.8	04.4	62.8	05.5	63
64	64.0	01.1	64.0	02.2	63.9	03.1	63.9	03.3	63.8	04.5	63.8	05.6	64
65	65.0	01.1	65.0	02.3	64.9	03.2	64.9	03.4	64.8	04.5	64.8	05.7	65
66	66.0	01.2	67.0	02.3	65.9	03.2	65.9	03.5	65.8	04.6	65.7	05.8	66
67	67.0	01.2	67.0	02.3	66.9	03.3	66.9	03.5	66.8	04.7	66.7	05.8	67
68	68.0	01.2	68.0	02.4	67.9	03.3	67.9	03.6	67.8	04.7	67.7	05.9	68
69	69.0	01.2	69.0	02.4	68.9	03.4	68.9	03.6	68.8	04.8	68.7	06.0	69
70	70.0	01.2	70.0	02.4	69.9	03.4	69.9	03.7	69.8	04.9	69.7	06.1	70
71	71.0	01.2	71.0	02.5	70.9	03.5	70.9	03.7	70.8	05.0	70.7	06.2	71
72	72.0	01.3	72.0	02.5	71.9	03.5	71.9	03.8	71.8	05.0	71.7	06.3	72
73	73.0	01.3	73.0	02.5	72.9	03.6	72.9	03.8	72.8	05.1	72.7	06.4	73
74	74.0	01.3	74.0	02.6	73.9	03.6	73.9	03.9	73.8	05.2	73.7	06.5	74
75	75.0	01.3	75.0	02.6	74.9	03.7	74.9	03.9	74.8	05.2	74.7	06.5	75
76	76.0	01.3	76.0	02.7	75.9	03.7	75.9	04.0	75.8	05.3	75.7	06.6	76
77	77.0	01.3	77.0	02.7	76.9	03.8	76.9	04.0	76.8	05.4	76.7	06.7	77
78	78.0	01.4	78.0	02.7	77.9	03.8	77.9	04.1	77.8	05.4	77.7	06.8	78
79	79.0	01.4	79.0	02.8	78.9	03.9	78.9	04.1	78.8	05.5	78.7	06.9	79
80	80.0	01.4	80.0	02.8	79.9	03.9	79.9	04.2	79.8	05.6	79.7	07.0	80
81	81.0	01.4	81.0	02.8	80.9	04.0	80.9	04.2	80.8	05.7	80.7	07.1	81
82	82.0	01.4	81.9	02.9	81.9	04.0	81.9	04.3	81.8	05.7	81.7	07.2	82
83	83.0	01.5	82.9	02.9	82.9	04.1	82.9	04.3	82.8	05.8	82.7	07.2	83
84	84.0	01.5	83.9	02.9	83.9	04.1	83.9	04.4	83.8	05.9	83.7	07.3	84
85	85.0	01.5	84.9	03.0	84.9	04.2	84.9	04.4	84.8	05.9	84.7	07.4	85
86	86.0	01.5	85.9	03.0	85.9	04.2	85.9	04.5	85.8	06.0	85.7	07.5	86
87	87.0	01.5	86.9	03.0	86.9	04.3	86.9	04.6	86.8	06.1	86.7	07.6	87
88	88.0	01.5	87.9	03.1	87.9	04.3	87.9	04.6	87.8	06.1	87.7	07.7	88
89	89.0	01.6	88.9	03.1	88.9	04.4	88.9	04.7	88.8	06.2	88.7	07.8	89
90	90.0	01.6	89.9	03.1	89.9	04.4	89.9	04.7	89.8	06.3	89.7	07.8	90
91	91.0	01.6	90.9	03.2	90.9	04.5	90.9	04.8	90.8	06.4	90.7	07.9	91
92	92.0	01.6	91.9	03.2	91.9	04.5	91.9	04.8	91.8	06.4	91.6	08.0	92
93	93.0	01.6	92.9	03.2	92.9	04.6	92.9	04.9	92.8	06.5	92.6	08.1	93
94	94.0	01.6	93.9	03.3	93.9	04.6	93.9	04.9	93.8	06.6	93.6	08.2	94
95	95.0	01.7	94.9	03.3	94.9	04.7	94.9	05.0	94.8	06.6	94.6	08.3	95
96	96.0	01.7	95.9	03.4	95.9	04.7	95.9	05.0	95.8	06.7	95.6	08.4	96
97	97.0	01.7	96.9	03.4	96.9	04.8	96.9	05.1	96.8	06.8	96.6	08.5	97
98	98.0	01.7	97.9	03.4	97.9	04.8	97.9	05.1	97.8	06.8	97.6	08.5	98
99	99.0	01.7	98.9	03.5	98.9	04.9	98.9	05.2	98.8	06.9	98.6	08.6	99
100	100.0	01.7	99.9	03.5	99.9	04.9	99.9	05.2	99.8	07.0	99.6	08.7	100
	Dep.	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	
Dist.	89 Deg.		88 Deg.		7¾ point		87 Deg		86 Deg		85 Deg.		Dist.

Dist.	½ Point		6 Deg		7 Deg		8 Deg.		¾ point		9 Deg.		Dist.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.2	1
2	02.0	00.2	02.0	00.2	02.0	00.2	02.0	00.3	02.0	00.3	02.0	00.3	2
3	03.0	00.3	03.0	00.3	03.0	00.4	03.0	00.4	03.0	00.4	03.0	00.5	3
4	04.0	00.4	04.0	00.4	04.0	00.5	04.0	00.6	04.0	00.6	03.9	00.6	4
5	05.0	00.5	05.0	00.5	05.0	00.6	05.0	00.7	04.9	00.7	04.9	00.8	5
6	06.0	00.6	06.0	00.6	06.0	00.7	05.9	00.8	05.9	00.9	05.9	00.9	6
7	07.0	00.7	07.0	00.7	06.9	00.9	06.9	01.0	06.9	01.0	06.9	01.1	7
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01.1	07.9	01.2	07.9	01.3	8
9	09.0	00.9	08.9	00.9	08.9	01.1	08.9	01.2	08.9	01.3	08.9	01.4	9
10	10.0	01.0	09.9	01.0	09.9	01.2	09.9	01.4	09.9	01.5	09.9	01.6	10
11	10.9	01.1	10.9	01.1	10.9	01.3	10.9	01.5	10.9	01.6	10.9	01.7	11
12	11.9	01.2	11.9	01.3	11.9	01.5	11.9	01.7	11.9	01.8	11.9	01.9	12
13	12.9	01.3	12.9	01.4	12.9	01.6	12.9	01.8	12.9	01.9	12.8	02.0	13
14	13.9	01.4	13.9	01.5	13.9	01.7	13.9	01.9	13.8	02.1	13.8	02.2	14
15	14.9	01.5	14.9	01.6	14.9	01.8	14.9	02.1	14.8	02.2	14.8	02.3	15
16	15.9	01.6	15.9	01.7	15.9	01.9	15.8	02.2	15.8	02.3	15.8	02.5	16
17	16.9	01.7	16.9	01.8	16.9	02.1	16.8	02.4	16.8	02.5	16.8	02.7	17
18	17.9	01.8	17.9	01.9	17.9	02.2	17.8	02.5	17.8	02.6	17.8	02.8	18
19	18.9	01.9	18.9	02.0	18.9	02.3	18.8	02.6	18.8	02.8	18.8	03.0	19
20	19.9	02.0	19.9	02.1	19.8	02.4	19.8	02.8	19.8	02.9	19.8	03.1	20
21	20.9	02.1	20.9	02.2	20.8	02.6	20.8	02.9	20.8	03.1	20.7	03.3	21
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4	22
23	22.9	02.3	22.9	02.4	22.8	02.8	22.8	03.2	22.8	03.4	22.7	03.6	23
24	23.9	02.4	23.9	02.5	23.8	02.9	23.8	03.3	23.7	03.5	23.7	03.8	24
25	24.9	02.4	24.9	02.6	24.8	03.0	24.8	03.5	24.7	03.7	24.7	03.9	25
26	25.9	02.5	25.9	02.7	25.8	03.2	25.7	03.6	25.7	03.8	25.7	04.1	26
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.8	26.7	04.0	26.7	04.2	27
28	27.9	02.7	27.8	02.9	27.8	03.4	27.7	03.9	27.7	04.1	27.7	04.4	28
29	28.9	02.8	28.8	03.0	28.8	03.5	28.7	04.0	28.7	04.3	28.6	04.5	29
30	29.9	02.9	29.8	03.1	29.8	03.7	29.7	04.2	29.7	04.4	29.6	04.7	30
31	30.8	03.0	30.8	03.2	30.8	03.8	30.7	04.3	30.7	04.5	30.6	04.8	31
32	31.8	03.1	31.8	03.3	31.8	03.9	31.7	04.5	31.7	04.7	31.6	05.0	32
33	32.8	03.2	32.8	03.4	32.8	04.0	32.7	04.6	32.6	04.8	32.6	05.2	33
34	33.8	03.3	33.8	03.6	33.7	04.1	33.7	04.7	33.6	05.0	33.6	05.3	34
35	34.8	03.4	34.8	03.7	34.7	04.3	34.7	04.9	34.6	05.1	34.6	05.5	35
36	35.8	03.5	35.8	03.8	35.7	04.4	35.6	05.0	35.6	05.3	35.6	05.6	36
37	36.8	03.6	36.8	03.9	36.7	04.5	36.6	05.1	36.6	05.4	36.5	05.8	37
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37.6	05.6	37.5	05.9	38
39	38.8	03.8	38.8	04.1	38.7	04.8	38.6	05.4	38.6	05.7	38.5	06.1	39
40	39.8	03.9	39.8	04.2	39.7	04.9	39.6	05.6	39.6	05.9	39.5	06.3	40
41	40.8	04.0	40.8	04.3	40.7	05.0	40.6	05.7	40.6	06.0	40.5	06.4	41
42	41.8	04.1	41.8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6	42
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	06.7	43
44	43.8	04.3	43.8	04.6	43.7	05.4	43.6	06.1	43.5	06.5	43.5	06.9	44
45	44.8	04.4	44.8	04.7	44.7	05.5	44.6	06.3	44.5	06.6	44.4	07.0	45
46	45.8	04.5	45.7	04.8	45.7	05.6	45.6	06.4	45.5	06.7	45.4	07.2	46
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06.5	46.5	06.9	46.4	07.3	47
48	47.8	04.7	47.7	05.0	47.6	05.9	47.5	06.7	47.5	07.0	47.4	07.5	48
49	48.8	04.8	48.7	05.1	48.6	06.0	48.5	06.8	48.5	07.2	48.4	07.7	49
50	49.8	04.9	49.7	05.2	49.6	06.1	49.5	07.0	49.5	07.3	49.4	07.8	50
	Dep	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	
Dist.	7½ Point		84 Deg.		83 Deg		82 Deg.		7¼ point		81 Deg.		Dist.

Dist.	½ Point		6 Deg.		7 Deg.		8 Deg.		¾ point		9 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.8	05.0	50.7	05.3	50.6	06.2	50.5	07.1	50.4	07.5	50.4	08.0	51
52	51.7	05.1	51.7	05.4	51.6	06.3	51.5	07.2	51.4	07.6	51.4	08.1	52
53	52.7	05.2	52.7	05.5	52.6	06.5	52.5	07.4	52.4	07.8	52.3	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06.6	53.5	07.5	53.4	07.9	53.3	08.4	54
55	54.7	05.4	54.7	05.7	54.6	06.7	54.5	07.7	54.4	08.1	54.3	08.6	55
56	55.7	05.5	55.7	05.9	55.6	06.8	55.5	07.8	55.4	08.2	55.3	08.8	56
57	56.7	05.6	56.7	06.0	56.6	06.9	56.4	07.9	56.4	08.4	56.3	08.9	57
58	57.7	05.7	57.7	06.1	57.6	07.1	57.4	08.1	57.4	08.5	57.3	09.1	58
59	58.7	05.8	58.7	06.2	58.6	07.2	58.4	08.2	58.4	08.7	58.3	09.2	59
60	59.7	05.9	59.7	06.3	59.5	07.3	59.4	08.4	59.4	08.8	59.3	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	08.9	60.2	09.5	61
62	61.7	06.1	61.7	06.5	61.5	07.6	61.4	08.6	61.3	09.1	61.2	09.7	62
63	62.7	06.2	62.7	06.6	62.5	07.7	62.4	08.8	62.3	09.2	62.2	09.9	63
64	63.7	06.3	63.6	06.7	63.5	07.8	63.4	08.9	63.3	09.4	63.2	10.0	64
65	64.7	06.4	64.6	06.8	64.5	07.9	64.4	09.0	64.3	09.5	64.2	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09.2	65.3	09.7	65.2	10.3	66
67	66.7	06.6	66.6	07.0	66.5	08.2	66.3	09.3	66.3	09.8	66.2	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08.3	67.3	09.5	67.3	10.0	67.2	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.3	10.1	68.2	10.8	69
70	69.7	06.9	69.6	07.3	69.5	08.5	69.3	09.7	69.2	10.3	69.1	10.9	70
71	70.7	07.0	70.6	07.4	70.5	08.7	70.3	09.9	70.2	10.4	70.1	11.1	71
72	71.7	07.1	71.6	07.5	71.5	08.8	71.3	10.0	71.2	10.6	71.1	11.3	72
73	72.6	07.2	72.6	07.6	72.5	08.9	72.3	10.2	72.2	10.7	72.1	11.4	73
74	73.6	07.3	73.6	07.7	73.4	09.0	73.3	10.3	73.2	10.9	73.1	11.6	74
75	74.6	07.3	74.6	07.8	74.4	09.1	74.3	10.4	74.2	11.0	74.1	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10.6	75.2	11.1	75.1	11.9	76
77	76.6	07.5	76.6	08.0	76.4	09.4	76.3	10.7	76.2	11.3	76.1	12.0	77
78	77.6	07.6	77.6	08.1	77.4	09.5	77.2	10.9	77.2	11.4	77.0	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09.6	78.2	11.0	78.1	11.6	78.0	12.4	79
80	79.6	07.8	79.6	08.4	79.4	09.8	79.2	11.1	79.1	11.7	79.0	12.5	80
81	80.6	07.9	80.6	08.5	80.4	09.9	80.2	11.3	80.1	11.9	80.0	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81.1	12.0	81.0	12.8	82
83	82.6	08.1	82.5	08.7	82.4	10.1	82.2	11.6	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83.5	08.8	83.4	10.2	83.2	11.7	83.1	12.3	83.0	13.1	84
85	84.6	08.3	84.5	08.9	84.4	10.4	84.2	11.8	84.1	12.5	84.0	13.3	85
86	85.6	08.4	85.5	09.0	85.4	10.5	85.2	12.0	85.1	12.6	84.9	13.4	86
87	86.6	08.5	86.5	09.1	86.3	10.6	86.2	12.1	86.1	12.8	85.9	13.6	87
88	87.6	08.6	87.5	09.2	87.3	10.7	87.1	12.2	87.0	12.9	86.9	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.8	88.1	12.4	88.0	13.1	87.9	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13.2	88.9	14.1	90
91	90.6	08.9	90.5	09.5	90.3	11.1	90.1	12.7	90.0	13.3	89.9	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	13.5	90.9	14.4	92
93	92.6	09.1	92.5	09.7	92.3	11.3	92.1	12.9	92.0	13.6	91.9	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11.5	93.1	13.1	93.0	13.8	92.8	14.7	94
95	94.5	09.3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	13.9	93.8	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95.1	13.4	95.0	14.1	94.8	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.1	13.5	96.0	14.2	95.8	15.2	97
98	97.5	09.6	97.5	10.2	97.3	11.9	97.0	13.6	96.9	14.4	96.8	15.3	98
99	98.5	09.7	98.5	10.3	98.3	12.1	98.0	13.8	97.9	14.5	97.8	15.5	99
100	99.5	09.8	99.4	10.4	99.2	12.2	99.0	13.9	98.9	14.7	93.8	15.6	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	7½ Point		84 Deg.		83 Deg.		82 Deg.		7¼ point		81 Deg.		Dist.

Dist.	10 Deg		11 Deg.		1 point		12 Deg.		13 Deg.		14 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	1
2	02.0	00.3	02.0	00.4	02.0	00.4	02.0	00.4	01.9	00.4	01.9	00.5	2
3	03.0	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7	3
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0	4
5	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.0	04.9	01.1	04.9	01.2	5
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4	6
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7	7
8	07.9	01.4	07.9	01.5	07.8	01.6	07.8	01.7	07.8	01.8	07.8	01.9	8
9	08.9	01.6	08.8	01.7	08.8	01.8	08.8	01.9	08.8	02.0	08.7	02.2	9
10	09.8	01.7	09.8	01.9	09.8	02.0	09.8	02.1	09.7	02.2	09.7	02.4	10
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7	11
12	11.3	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9	12
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1	13
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4	14
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.6	03.6	15
16	15.8	02.8	15.7	03.1	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9	16
17	16.7	03.0	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1	17
18	17.7	03.1	17.7	03.4	17.7	03.5	17.6	03.7	17.5	04.0	17.5	04.4	18
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.3	18.4	04.6	19
20	19.7	03.5	19.6	03.8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8	20
21	20.7	03.6	20.6	04.0	20.6	04.1	20.5	04.4	20.5	04.7	20.4	05.1	21
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3	22
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6	23
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8	24
25	24.6	04.3	24.5	04.8	24.5	04.9	24.5	05.2	24.4	05.6	24.3	06.0	25
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3	26
27	26.6	04.7	26.5	05.2	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5	27
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27.3	06.3	27.2	06.8	28
29	28.6	05.0	28.5	05.5	28.4	05.7	28.4	06.0	28.3	06.5	28.1	07.0	29
30	29.5	05.2	29.4	05.7	29.4	05.9	29.3	06.2	29.2	06.7	29.1	07.3	30
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30.2	07.0	30.1	07.5	31
32	31.5	05.6	31.4	06.1	31.4	06.2	31.3	06.7	31.2	07.2	31.0	07.7	32
33	32.5	05.7	32.4	06.3	32.4	06.4	32.3	06.9	32.2	07.4	32.0	08.0	33
34	33.5	05.9	33.4	06.5	33.3	06.6	33.3	07.1	33.1	07.6	33.0	08.2	34
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34.1	07.9	34.0	08.5	35
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	08.7	36
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.1	08.3	35.9	09.0	37
38	37.4	06.6	37.3	07.2	37.3	07.4	37.2	07.9	37.0	08.5	36.9	09.2	38
39	38.4	05.8	38.3	07.4	38.3	07.6	38.1	08.1	38.0	08.8	37.8	09.4	39
40	39.4	06.9	39.3	07.6	39.2	07.8	39.1	08.3	39.0	09.0	38.8	09.7	40
41	40.4	07.1	40.2	07.8	40.2	08.0	40.1	08.5	39.9	09.2	39.8	09.9	41
42	41.4	07.3	41.2	08.0	41.2	08.2	41.1	08.7	40.9	09.4	40.8	10.2	42
43	42.3	07.5	42.2	08.2	42.2	08.4	42.1	08.9	41.9	09.7	41.7	10.4	43
44	43.3	07.6	43.2	08.4	43.2	08.6	43.0	09.1	42.9	09.9	42.7	10.6	44
45	44.3	07.8	44.2	08.6	44.1	08.8	44.0	09.4	43.8	10.1	43.7	11.0	45
46	45.3	08.0	45.2	08.8	45.1	09.0	45.0	09.6	44.8	10.3	44.6	11.1	46
47	46.3	08.2	46.1	09.0	46.1	09.2	46.0	09.8	45.8	10.6	45.6	11.4	47
48	47.3	08.3	47.1	09.2	47.1	09.4	47.0	10.0	46.8	10.8	46.6	11.6	48
49	48.3	08.5	48.1	09.3	48.1	09.6	47.9	10.2	47.7	11.0	47.5	11.9	49
50	49.2	08.7	49.1	09.5	49.0	09.8	48.9	10.4	48.7	11.2	48.5	12.1	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	80 Deg.		79 Deg.		7 point		78 Deg.		77 Deg.		76 Deg.		

Diſt.	10 Deg.		11 Deg.		1 point		12 Deg.		13 Deg		14 Deg.		Diſt.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.2	08.9	50.1	09.7	50.0	10.0	49.9	10.6	49.7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0	10.1	50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52.0	10.3	51.8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54.8	11.6	54.6	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.9	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13.8	57
58	57.1	10.1	56.9	11.1	56.9	11.3	56.7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58.7	12.5	58.5	13.5	58.2	14.5	60
61	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11.8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62.0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15.2	63
64	63.0	11.1	62.8	12.2	62.8	12.5	62.6	13.3	62.4	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.8	12.7	63.6	13.5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64.6	13.7	64.3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.3	15.3	66.0	16.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14.6	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69.7	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17.2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70.4	15.0	70.2	16.2	69.9	17.4	72
73	71.9	12.7	71.7	13.9	71.6	14.2	71.4	15.2	71.1	16.4	70.8	17.7	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14.3	73.6	14.6	73.4	15.6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74.6	14.5	74.5	14.8	74.3	15.8	74.1	17.1	73.7	18.4	76
77	75.8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.7	19.1	79
80	78.8	13.9	78.5	15.3	78.5	15.6	78.2	16.6	78.0	18.0	77.6	19.4	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18.2	78.6	19.6	81
82	80.8	14.2	80.5	15.6	80.4	16.0	80.2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81.5	15.8	81.4	16.2	81.2	17.3	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82.2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83.8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.8	19.6	84.4	21.0	87
88	86.7	15.3	85.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	86.7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.3	17.8	89.0	18.9	88.7	20.5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19.1	89.6	20.7	89.3	22.3	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.3	90.6	20.9	90.2	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.6	16.5	93.3	18.1	93.2	18.5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94.9	20.2	94.5	21.8	94.1	23.5	97
98	96.5	17.0	96.2	18.7	96.1	19.1	95.9	20.4	95.5	22.0	95.1	23.7	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	23.9	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.5	97.0	24.2	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Diſt.	80 Deg.		79 Deg.		7 point		78 Deg.		77 Deg.		76 Deg.		Diſt.

Dist.	1¼ point		15 Deg.		16 Deg		1½ Point		17 Deg.		18 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.9	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.5	05.8	01.7	05.7	01.7	05.7	01.8	05.7	01.9	6
7	06.8	04.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.7	02.5	08.6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.7	10.6	02.8	10.6	03.0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.6	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.1	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	05.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.1	06.6	23.0	07.0	22.9	07.0	22.8	07.4	24
25	24.2	06.1	24.1	06.5	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	05.3	25.1	06.7	25.0	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	26.0	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.8	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.7	28
29	28.1	07.0	28.0	07.5	27.9	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.8	30.9	08.3	30.8	08.8	30.6	09.3	30.6	09.4	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.1	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.4	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.4	38.5	11.0	38.3	11.6	38.3	11.7	38.0	12.4	40
41	39.8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.4	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45.9	13.9	45.9	14.0	45.7	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	6¾ point		75 Deg.		76 Deg.		6½ Point		73 Deg.		72 Deg.		

Dist.	1¼ Point		15 Deg.		16 Deg.		1½ point		17 Deg.		18 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	49.5	12.4	49.3	13.2	49.0	14.1	48.8	14.8	48.8	14.9	48.5	15.8	51
52	50.4	12.6	50.2	13.5	50.0	14.3	49.7	15 1	49.7	15.2	49 4	16.1	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	53
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51 6	15.8	51.3	16.7	54
55	53.3	13 4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17.0	55
56	54.3	13.6	54.1	14.5	53.8	15.4	53.5	16.2	53.5	16.4	53.3	17.3	56
57	55 3	13.9	55.1	14.8	54.8	15.7	54.5	16.5	54.5	16.7	54.2	17.6	57
58	56.3	14.1	56.0	15.0	55.8	16.0	55.5	16.8	55.5	17.0	55.2	17.9	58
59	57.2	14.3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.3	56.1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17.4	57.4	17.5	57.1	18.5	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	18.8	61
62	60.1	15.1	59.9	16.0	59.6	17.1	59.3	18.0	59.3	18.1	59.0	19.2	62
63	61.1	15.3	60.9	16.3	60.6	17.4	60.3	18 3	60.2	18.4	59.9	19.5	63
64	62.1	15.6	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17.9	62.2	18.9	62.2	19.0	61.8	20.1	65
66	64.0	16.0	63.7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20.4	66
67	65.0	16.3	64.7	17.3	64.4	18.5	64.1	19.4	64.1	19 6	63.7	20.7	67
68	66.0	16.5	65.7	17.6	65.4	18.7	65.1	19.7	65.0	19.9	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19.0	66.0	20.0	66.0	20.2	65.6	21.3	69
70	67.9	17.0	67.6	18.1	67.3	19.3	67.0	20.3	66.9	20 5	66.6	31.6	70
71	68.9	17.3	68.6	18.4	68.3	19.6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19 8	68.9	20.9	68 8	21.1	68.5	22.2	72
73	70.8	17.7	70.5	18.9	70.2	20.1	69.9	21.2	69.8	21.3	69.4	22.6	73
74	71.8	18.0	71.5	19.2	71.1	20.4	70.8	21.5	70.8	21.6	70.4	22.9	74
75	72.7	18 2	72.4	19.4	72.1	20.7	71.8	21.8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.1	20.9	72.7	22.1	72.7	22.2	72.3	23.5	76
77	74.7	18.7	74.4	19.9	74.0	21.2	73.7	22.4	73.6	22.5	73.2	23.8	77
78	75.7	19.0	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22 8	74.2	24.1	78
79	76.6	19.2	76.3	20.4	75 9	21.8	75.6	22.9	75.5	23.1	75.1	24 4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23.2	76.5	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22.3	77.5	23.5	77.5	23.7	77.0	25.0	81
82	79.5	19.9	79.2	21.2	78.8	22.6	78.5	23.8	78.4	24.0	78 0	25.3	82
83	80.5	20.2	80.2	21.5	79.8	22.9	79.4	24.1	79.4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.7	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82.4	20.7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	80.8	26.3	85
86	83.4	20.9	83.1	22.3	82.7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84.4	21.1	84.0	22.5	83.6	24.0	83.3	25.3	83.2	25.4	82.7	26.9	87
88	85.4	21.4	85 0	22.8	84.6	24.3	84.2	25.5	84.2	25.7	83.7	27.2	88
89	86.3	21.6	86.0	23.0	85.6	24.5	85 2	25.8	85.1	26.0	84 6	27.5	89
90	87.3	21 9	86 9	23.3	86.5	24.8	86.1	26.1	86.1	26.3	85.6	27.8	90
91	88.3	22.1	87.9	23.5	87.5	25.1	87.1	26.4	87.0	26.6	86.5	28.1	91
92	89.2	22.4	88.9	23.8	88.4	25.4	88.0	26.7	88.0	26.9	87.5	28.4	92
93	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.9	27.2	88.4	28.7	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89.4	29.0	94
95	92.1	23.1	91.8	24.6	91.3	26.2	90.9	27.6	90.8	27.8	90.4	29.4	95
96	93.1	23.3	92.7	24.8	92.3	26.5	91.9	27.9	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	28.2	92.8	28.4	92.3	30.0	97
98	95.1	23 8	94.7	25.4	94.2	27.0	93.8	28.4	93.7	28.7	93.2	30.3	98
99	96.0	24.1	95.6	25.6	95.2	27.3	94.7	28.7	94.7	28.9	94.2	30.6	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95.7	29.0	95.6	29.2	95.1	30.9	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	6 Point		75 Deg.		74 Deg.		6½ point		73 Deg.		72 Deg.		Dist.

Dist.	1¼ point		15 Deg.		16 Deg		1½ Point		17 Deg.		18 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	91.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.9	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.5	05.8	01.7	05.7	01.7	05.7	01.8	05.7	01.9	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.7	02.5	08.6	02.6	08.6	02.6	03.6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.7	10.6	02.8	10.6	03.0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.6	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	05.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.1	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.1	06.6	23.0	07.0	22.9	07.0	22.8	07.4	24
25	24.2	06.1	24.1	06.5	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	05.3	25.1	06.7	25.0	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	26.0	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.8	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.7	28
29	28.1	07.0	28.0	07.5	27.9	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.8	30.9	08.3	30.8	08.8	30.6	09.3	30.6	09.4	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.1	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.4	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.4	38.5	11.0	38.3	11.6	38.3	11.7	38.0	12.4	40
41	39.8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.4	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45.9	13.9	45.9	14.0	45.7	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	6¾ point		75 Deg.		76 Deg.		6½ Point		73 Deg.		72 Deg.		

Dist.	1¼ Point		15 Deg.		16 Deg.		1½ point		17 Deg.		18 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	49.5	12.4	49.3	13.2	49.0	14.1	48.8	14.8	48.8	14.9	48.5	15.8	51
52	50.4	12.6	50.2	13.5	50.0	14.3	49.7	15.1	49.7	15.2	49.4	16.1	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	53
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51.6	15.8	51.3	16.7	54
55	53.3	13.4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17.0	55
56	54.3	13.6	54.1	14.5	53.8	15.4	53.6	16.2	53.5	16.4	53.3	17.3	56
57	55.3	13.9	55.1	14.8	54.8	15.7	54.5	16.5	54.5	16.7	54.2	17.6	57
58	56.3	14.1	56.0	15.0	55.8	16.0	55.5	16.8	55.5	17.0	55.2	17.9	58
59	57.2	14.3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.3	56.1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17.4	57.4	17.5	57.1	18.5	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	18.8	61
62	60.1	15.1	59.9	16.0	59.6	17.1	59.3	18.0	59.3	18.1	59.0	19.2	62
63	61.1	15.3	60.9	16.3	60.6	17.4	60.3	18.3	60.2	18.4	59.9	19.5	63
64	62.1	15.6	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17.9	62.2	18.9	62.2	19.0	61.8	20.1	65
66	64.0	16.0	63.7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20.4	66
67	65.0	16.3	64.7	17.3	64.4	18.5	64.1	19.4	64.1	19.6	63.7	20.7	67
68	66.0	16.5	65.7	17.6	65.4	18.7	65.1	19.7	65.0	19.9	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19.0	66.0	20.0	66.0	20.2	65.6	21.3	69
70	67.9	17.0	67.6	18.1	67.3	19.3	67.0	20.3	66.9	20.5	66.6	21.6	70
71	68.9	17.3	68.6	18.4	68.3	19.6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19.8	68.9	20.9	68.8	21.1	68.5	22.2	72
73	70.8	17.7	70.5	18.9	70.2	20.1	69.9	21.2	69.8	21.3	69.4	22.6	73
74	71.8	18.0	71.5	19.2	71.1	20.4	70.8	21.5	70.8	21.6	70.4	22.9	74
75	72.7	18.2	72.4	19.4	72.1	20.7	71.8	21.8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.1	20.9	72.7	22.1	72.7	22.2	72.3	23.5	76
77	74.7	18.7	74.4	19.9	74.0	21.2	73.7	22.4	73.6	22.5	73.2	23.8	77
78	75.7	19.0	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22.8	74.2	24.1	78
79	76.6	19.2	76.3	20.4	75.9	21.8	75.6	22.9	75.5	23.1	75.1	24.4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23.2	76.5	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22.3	77.5	23.5	77.5	23.7	77.0	25.0	81
82	79.5	19.9	79.2	21.2	78.8	22.6	78.5	23.8	78.4	24.0	78.0	25.3	82
83	80.5	20.2	80.2	21.5	79.8	22.9	79.4	24.1	79.4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.7	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82.4	20.7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	80.8	26.3	85
86	83.4	20.9	83.1	22.3	82.7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84.4	21.1	84.0	22.5	83.6	24.0	83.3	25.3	83.2	25.4	82.7	26.9	87
88	85.4	21.4	85.0	22.8	84.6	24.3	84.2	25.5	84.2	25.7	83.7	27.2	88
89	86.3	21.6	86.0	23.0	85.6	24.5	85.2	25.8	85.1	26.0	84.6	27.5	89
90	87.3	21.9	86.9	23.3	86.5	24.8	86.1	26.1	86.1	26.3	85.6	27.8	90
91	88.3	22.1	87.9	23.5	87.5	25.1	87.1	26.4	87.0	26.6	86.5	28.1	91
92	89.2	22.4	88.9	23.8	88.4	25.4	88.0	26.7	88.0	26.9	87.5	28.4	92
93	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.9	27.2	88.4	28.7	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89.4	29.0	94
95	92.1	23.1	91.8	24.6	91.3	26.2	90.9	27.6	90.8	27.8	90.4	29.4	95
96	93.1	23.3	92.7	24.8	92.3	26.5	91.9	27.9	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	28.2	92.8	28.4	92.3	30.0	97
98	95.1	23.8	94.7	25.4	94.2	27.0	93.8	28.4	93.7	28.7	93.2	30.3	98
99	96.0	24.1	95.6	25.6	95.2	27.3	94.7	28.7	94.7	28.9	94.2	30.6	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95.7	29.0	95.6	29.2	95.1	30.9	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	6 Point		75 Deg.		74 Deg.		6½ point		73 Deg.		72 Deg.		

Dist.	19 Deg		1¾ Point		20 Deg		21 Deg		22 Deg.		2 Points		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	02.0	05.6	02.0	05.6	02.1	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	05.6	02.4	06.6	02.4	06.5	02.5	05.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.1	04.7	12.1	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.5	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.2	16.8	06.5	16.7	06.7	16.6	06.9	18
19	18.0	06.2	17.9	06.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.8	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.7	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.6	08.2	22.4	08.6	22.3	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.3	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.3	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.8	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.9	11.5	29.7	12.0	29.6	12.2	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.5	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.0	34.8	12.5	34.8	12.7	34.5	13.3	34.3	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	35.1	14.5	38
39	36.9	12.7	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	37.0	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.4	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.7	16.8	44
45	42.5	14.7	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.9	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.9	16.5	42.7	17.2	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	16.0	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.4	45.3	18.8	49
50	47.3	16.3	47.1	16.8	47.0	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	71 Deg.		6¼ Point		70 Deg		69 Deg		68 Deg.		6 Points		

Dist.	19 Deg.		1¾ Point		20 Deg.		21 Deg.		22 Deg.		2 point		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	48.2	16.6	48.0	17.2	47.9	17.4	47.6	18.3	47.3	19.1	47.1	19.5	51
52	49.2	16.9	49.0	17.5	48.9	17.8	48.5	18.6	48.2	19.5	48.0	19.9	52
53	50.1	17.3	49.9	17.9	49.8	18.1	49.5	19.0	49.1	19.9	49.0	20.3	53
54	51.0	17.6	50.8	18.2	50.7	18.5	50.4	19.4	50.1	20.2	49.9	20.7	54
55	52.0	17.9	51.8	18.5	51.7	18.8	51.3	19.7	51.0	20.6	50.8	21.0	55
56	52.9	18.2	52.7	18.9	52.6	19.2	52.3	20.1	51.9	21.0	51.7	21.4	56
57	53.9	18.6	53.7	19.2	53.6	19.5	53.2	20.4	52.8	21.4	52.7	21.8	57
58	54.8	18.9	54.6	19.5	54.5	19.8	54.1	20.8	53.8	21.7	53.6	22.2	58
59	55.8	19.2	55.5	19.9	55.4	20.2	55.1	21.1	54.7	22.1	54.5	22.6	59
60	56.7	19.5	56.5	20.2	56.4	20.5	56.0	21.5	55.6	22.5	55.4	23.0	60
61	57.7	19.9	57.4	20.6	57.3	20.9	56.9	21.9	56.5	22.8	56.4	23.3	61
62	58.6	20.2	58.4	20.9	58.3	21.2	57.9	22.2	57.5	23.2	57.3	23.7	62
63	59.6	20.5	59.3	21.2	59.2	21.5	58.8	22.6	58.4	23.6	58.2	24.1	63
64	60.5	20.8	60.3	21.6	60.1	21.9	59.7	22.9	59.3	24.0	59.1	24.5	64
65	61.5	21.2	61.2	21.9	61.1	22.2	60.7	23.3	60.3	24.3	60.1	24.9	65
66	62.4	21.5	62.1	22.2	62.0	22.6	61.6	23.7	61.2	24.7	61.0	25.3	66
67	63.3	21.8	63.1	22.6	63.0	22.9	62.6	24.0	62.1	25.1	61.9	25.6	67
68	64.3	22.1	64.0	22.9	63.9	23.3	63.5	24.4	63.0	25.5	62.8	26.0	68
69	65.2	22.5	65.0	23.2	64.8	23.6	64.4	24.7	64.0	25.8	63.7	26.4	69
70	66.2	22.8	65.9	23.6	65.8	23.9	65.4	25.1	64.9	26.2	64.7	26.8	70
71	67.1	23.1	66.8	23.9	66.7	24.3	66.3	25.4	65.8	26.6	65.6	27.2	71
72	68.1	23.4	67.8	24.3	67.7	24.6	67.2	25.8	66.8	27.0	66.5	27.6	72
73	69.0	23.8	68.7	24.6	68.6	25.0	68.2	26.2	67.7	27.3	67.4	27.9	73
74	70.0	24.1	69.7	24.9	69.5	25.3	69.1	26.5	68.6	27.7	68.4	28.3	74
75	70.9	24.4	70.6	25.3	70.5	25.6	70.0	26.9	69.5	28.1	69.3	28.7	75
76	71.9	24.7	71.6	25.6	71.4	26.0	71.0	27.2	70.5	28.5	70.2	29.1	76
77	72.8	25.1	72.5	25.9	72.4	26.3	71.9	27.6	71.4	28.8	71.1	29.5	77
78	73.7	25.4	73.4	26.3	73.3	26.7	72.8	28.0	72.3	29.2	72.1	29.8	78
79	74.7	25.7	74.4	26.6	74.2	27.0	73.8	28.3	73.2	29.6	73.0	30.2	79
80	75.6	26.0	75.3	27.0	75.2	27.4	74.7	28.7	74.2	30.0	73.9	30.6	80
81	76.6	26.4	76.3	27.3	76.1	27.7	75.6	29.0	75.1	30.3	74.8	31.0	81
82	77.5	26.7	77.2	27.6	77.1	28.0	76.6	29.4	76.0	30.7	75.8	31.4	82
83	78.5	27.0	78.1	28.0	78.0	28.4	77.5	29.7	77.0	31.1	76.7	31.8	83
84	79.4	27.3	79.1	28.3	78.9	28.7	78.4	30.1	77.9	31.5	77.6	32.1	84
85	80.4	27.7	80.0	28.6	79.9	29.1	79.4	30.5	78.8	31.8	78.5	32.5	85
86	81.3	28.0	81.0	29.0	80.8	29.4	80.3	30.8	79.7	32.2	79.5	32.9	86
87	82.3	28.3	81.9	29.3	81.8	29.8	81.2	31.2	80.7	32.6	80.4	33.3	87
88	83.2	28.7	82.9	29.6	82.7	30.1	82.2	31.5	81.6	33.0	81.3	33.7	88
89	84.1	29.0	83.8	30.0	83.6	30.4	83.1	31.9	82.5	33.3	82.2	34.1	89
90	85.1	29.3	84.7	30.3	84.6	30.8	84.0	32.3	83.4	33.7	83.2	34.4	90
91	86.0	29.6	85.7	30.7	85.5	31.1	85.0	32.6	84.4	34.1	84.1	34.8	91
92	87.0	30.0	86.6	31.0	86.5	31.5	85.9	33.0	85.3	34.5	85.0	35.2	92
93	88.0	30.3	87.6	31.3	87.4	31.8	86.8	33.3	86.2	34.8	85.9	35.6	93
94	88.9	30.6	88.5	31.7	88.3	32.1	87.8	33.7	87.2	35.2	86.8	36.0	94
95	89.8	30.9	89.4	32.0	89.3	32.5	88.7	34.0	88.1	35.6	87.8	36.4	95
96	90.8	31.3	90.4	32.3	90.2	32.8	89.6	34.4	89.0	36.0	88.7	36.7	96
97	91.7	31.6	91.3	32.7	91.1	33.2	90.6	34.8	89.9	36.3	89.6	37.1	97
98	92.7	31.9	92.3	33.0	92.1	33.5	91.5	35.1	90.9	36.7	90.5	37.5	98
99	93.6	32.2	93.2	33.4	93.0	33.9	92.4	35.5	91.8	37.1	91.5	37.9	99
100	94.5	32.6	94.2	33.7	94.0	34.2	93.4	35.8	92.7	37.5	92.4	38.3	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	71 Deg.		6¼ Point		70 Deg.		69 Deg.		68 Deg.		6 point		

Dist.	23 Deg		24 Deg		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Dist.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.5	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.7	01.6	03.6	01.7	03.6	01.7	03.6	01.8	03.6	01.8	4
5	04.6	02.0	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.3	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.8	05.6	11.7	05.7	11.6	05.9	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	06.0	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.8	14.4	07.0	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.5	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.5	18.1	08.6	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.3	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.6	19.6	10.0	22
23	21.2	09.0	21.0	09.4	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.8	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.8	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.9	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.2	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.5	29.4	15.0	33
24	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.5	33.8	15.0	33.5	15.6	33.4	15.8	33.3	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.5	34.4	16.1	34.4	16.2	34.2	16.7	33.9	17.3	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.1	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.3	16.9	36.2	17.1	36.0	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.9	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.0	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.1	44.8	19.9	44.4	20.7	44.3	21.0	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.5	22.7	50
Dist.	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	Dist.
	67 Deg.		66 Deg		65 Deg		5¾ Point		64 Deg.		63 Deg.		

Dist. l	23 Deg.		24 Deg		25 Deg.		2¼ Point		26 Deg		27 Deg.		Dist. l
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	46.9	19.9	46.6	20.7	46.2	21 6	46.1	21.8	45.8	22.4	45.4	23.2	51
52	47 9	20 3	47.5	21.1	47.1	22.0	47 0	22.2	46.7	22.8	46.3	23 6	52
53	48.8	20.7	48.4	21.6	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21 1	49.3	22.0	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51 2	22.8	50.8	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	12.7	53.0	23.6	52.6	24 5	52 4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.1	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.7	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25 8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	57.0	26.9	56 6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.1	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.8	25.8	60.3	26.8	59.8	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.6	28.7	61.5	29.1	61.1	29.8	60.6	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27 3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.4	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30 4	63.8	31.1	63.3	32.2	71
72	66 3	28.1	65.8	29.3	65.3	30.4	65.1	30.8	64.7	31 6	64.2	32.7	72
73	67 2	28.5	66 7	29.7	66.2	30.8	66.0	31.2	65.6	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.5	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32 9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.8	68.6	35.0	77
78	71.8	30.5	71.3	31.7	70.7	33.0	70.5	33 4	70.1	34.2	69.5	35.4	78
79	72 7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.0	34.6	70.4	35.9	79
80	73 6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.3	36.3	80
81	74.5	31.6	74.0	32.9	73.4	34.2	73.2	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73 1	37.2	82
83	76.4	32.4	75.8	33.8	75.2	35.1	75.0	35.5	74.6	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.2	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	76.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	35.8	79.8	37.2	79.6	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.5	80.2	40.9	90
91	83.8	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.9	81.1	41.3	91
92	84.7	35.9	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41 2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.4	37.5	87.7	39.0	87.0	40.6	86.8	41.0	86.3	42.1	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.3	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.1	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.0	39.1	91.4	40.7	90.6	42.3	90.4	42.8	89.9	43.8	89.1	45.4	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	67 Deg.		66 Deg.		65 Deg		5¾ point		64 Deg		63 Deg.		

Dist.	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ point		31 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	1
2	01.8	00.9	01.8	00.9	01.7	01.0	01.7	01.0	01.7	01.0	01.7	01.0	2
3	02.6	01.4	02.6	01.4	02.6	01.5	02.6	01.5	02.6	01.5	02.6	01.5	3
4	03.5	01.9	03.5	01.9	03.5	01.9	03.5	02.0	03.4	02.1	03.4	02.1	4
5	04.4	02.3	04.4	02.4	04.4	02.4	04.3	02.5	04.3	02.6	04.3	02.6	5
6	05.3	02.8	05.3	02.8	05.2	02.9	05.2	03.0	05.1	03.1	05.1	03.1	6
7	06.2	03.3	06.2	03.3	06.1	03.4	06.1	03.5	06.0	03.6	06.0	03.6	7
8	07.1	03.8	07.1	03.8	07.0	03.9	06.9	04.0	06.9	04.1	06.9	04.1	8
9	07.9	04.2	07.9	04.2	07.9	04.4	07.8	04.5	07.7	04.6	07.7	04.6	9
10	08.8	04.7	08.8	04.7	08.7	04.8	08.7	05.0	08.6	05.1	08.6	05.1	10
11	09.7	05.2	09.7	05.2	09.6	05.3	09.5	05.5	09.4	05.7	09.4	05.7	11
12	10.6	05.6	10.6	05.7	10.5	05.8	10.4	06.0	10.3	06.2	10.3	06.2	12
13	11.5	06.1	11.5	06.1	11.4	06.3	11.3	06.5	11.1	06.7	11.1	06.7	13
14	12.4	06.6	12.3	06.6	12.2	06.8	12.1	07.0	12.0	07.2	12.0	07.2	14
15	13.2	07.0	13.2	07.1	13.1	07.3	13.0	07.5	12.9	07.7	12.9	07.7	15
16	14.1	07.5	14.1	07.5	14.0	07.8	13.9	08.0	13.7	08.2	13.7	08.2	16
17	15.0	08.0	15.0	08.0	14.9	08.2	14.7	08.5	14.6	08.7	14.6	08.8	17
18	15.9	08.5	15.9	08.5	15.7	08.7	15.6	09.0	15.4	09.3	15.4	09.3	18
19	16.8	08.9	16.8	09.0	16.6	09.2	16.5	09.5	16.3	09.8	16.3	09.8	19
20	17.7	09.4	17.6	09.4	17.5	09.7	17.3	10.0	17.2	10.3	17.1	10.3	20
21	18.5	09.9	18.5	09.9	18.4	10.2	18.2	10.5	18.0	10.8	18.0	10.8	21
22	19.4	10.3	19.4	10.4	19.2	10.7	19.1	11.0	18.9	11.3	18.9	11.3	22
23	20.3	10.8	20.3	10.8	20.1	11.1	19.9	11.5	19.7	11.8	19.7	11.8	23
24	21.2	11.3	21.2	11.3	21.0	11.6	20.8	12.0	20.6	12.3	20.6	12.4	24
25	22.1	11.7	22.0	11.8	21.9	12.1	21.6	12.5	21.4	12.9	21.4	12.9	25
26	23.0	12.2	22.9	12.3	22.7	12.6	22.5	13.0	22.3	13.4	22.3	13.4	26
27	23.8	12.7	23.8	12.7	23.6	13.1	23.4	13.5	23.2	13.9	23.1	13.9	27
28	24.7	13.1	24.7	13.2	24.5	13.6	24.2	14.0	24.0	14.4	24.0	14.4	28
29	25.6	13.6	25.6	13.7	25.4	14.1	25.1	14.5	24.9	14.9	24.9	14.9	29
30	26.5	14.1	26.5	14.1	26.2	14.5	26.0	15.0	25.7	15.4	25.7	15.4	30
31	27.4	14.6	27.3	14.6	27.1	15.0	26.8	15.5	26.6	15.9	26.6	16.0	31
32	28.3	15.0	28.2	15.1	28.0	15.5	27.7	16.0	27.4	16.4	27.4	16.5	32
33	29.1	15.5	29.1	15.6	28.9	16.0	28.6	16.5	28.3	17.0	28.3	17.0	33
34	30.0	16.0	30.0	16.0	29.7	16.5	29.4	17.0	29.2	17.5	29.1	17.5	34
35	30.9	16.4	30.9	16.5	30.6	17.0	30.3	17.5	30.0	18.0	30.0	18.0	35
36	31.8	16.9	31.7	17.0	31.5	17.5	31.2	18.0	30.9	18.5	30.9	18.5	36
37	32.7	17.4	32.6	17.4	32.4	17.9	32.0	18.5	31.7	19.0	31.7	19.1	37
38	33.5	17.8	33.5	17.9	33.2	18.4	32.9	19.0	32.6	19.5	32.6	19.6	38
39	34.4	18.3	34.4	18.4	34.1	18.9	33.8	19.5	33.4	20.0	33.4	20.1	39
40	35.3	18.8	35.3	18.9	35.0	19.4	34.6	20.0	34.3	20.6	34.3	20.6	40
41	36.2	19.2	36.2	19.3	35.9	19.9	35.5	20.5	35.2	21.1	35.1	21.1	41
42	37.1	19.7	37.0	19.8	36.7	20.4	36.4	21.0	36.0	21.6	36.0	21.6	42
43	38.0	20.2	37.9	20.3	37.6	20.8	37.2	21.5	36.9	22.1	36.9	22.1	43
44	38.8	20.7	38.8	20.7	38.5	21.3	38.1	22.0	37.7	22.6	37.7	22.7	44
45	39.7	21.1	39.7	21.2	39.4	21.8	39.0	22.5	38.6	23.1	38.6	23.2	45
46	40.6	21.6	40.6	21.7	40.2	22.3	39.8	23.0	39.5	23.6	39.4	23.7	46
47	41.5	22.1	41.4	22.2	41.1	22.8	40.7	23.5	40.3	24.2	40.3	24.2	47
48	42.4	22.5	42.3	22.6	42.0	23.3	41.6	24.0	41.2	24.7	41.1	24.7	48
49	43.3	23.0	43.2	23.1	42.9	23.8	42.4	24.5	42.0	25.2	42.0	25.2	49
50	44.1	23.5	44.1	23.6	43.7	24.2	43.3	25.0	42.9	25.7	42.9	25.7	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	62 Deg.		5½ Point		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Dist.	28 Deg.		2½ Point		29 Deg.		30 Deg		2¾ Point		31 Deg.		Dist.
	Lat.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.6	26.7	44.6	26.8	52
53	46.8	24.9	46.7	25.0	46.4	25.7	45.9	26.5	45.5	27.2	45.4	27.3	53
54	47.7	25.4	47.6	25.5	47.2	26.2	46.8	27.0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.2	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26.4	49.0	27.1	48.5	28.0	48.0	28.8	48.0	28.8	56
57	50.3	26.8	50.3	26.9	49.9	27.6	49.4	28.5	48.9	29.3	48.9	29.4	57
58	51.2	27.2	51.2	27.3	50.7	28.1	50.2	29.0	49.7	29.8	49.7	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30.3	50.6	30.4	59
60	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	60
61	53.9	28.6	53.8	28.8	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.4	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.6	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	66
67	59.2	31.5	59.1	31.6	58.6	32.5	58.0	33.5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60.0	32.1	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.9	32.5	60.3	33.5	59.8	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	00.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.4	36.0	61.8	37.0	61.7	37.1	72
73	64.5	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	64.1	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64.3	38.6	64.3	38.6	75
76	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	76
77	68.0	36.2	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	79
80	70.6	37.6	70.6	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.5	41.6	69.4	41.7	81
82	72.4	38.5	72.3	38.7	71.7	39.8	71.0	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73.2	39.1	72.6	40.2	71.9	41.5	71.2	42.7	71.1	42.7	83
84	74.2	39.4	74.1	39.6	73.5	40.7	72.7	42.0	72.0	43.2	72.0	43.3	84
85	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	85
86	75.9	40.4	75.8	40.5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	42.0	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	89
90	79.5	42.3	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.3	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	92
93	82.1	43.7	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.3	84.0	46.5	83.1	48.0	82.3	49.4	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
	Dep.	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	62 Deg.		5½ point		61 Deg		60 Deg.		5¼ Point		59 Deg.		Dist.

Dist.	32 Deg.		33 Deg.		3 Point		34 Deg		35 Deg.		36 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.5	00.8	00.5	00.8	03.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.6	01.2	2
3	02.5	01.6	02.5	01.6	02.5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03.3	02.2	03.3	02.3	03.2	02.4	4
5	04.2	02.6	04.2	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.3	04.9	03.4	04.9	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06.8	04.2	06.7	04.4	06.6	04.4	06.6	04.5	06.6	04.6	06.5	04.7	8
9	07.6	04.8	07.5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05.4	08.3	05.6	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09.1	06.1	09.1	06.2	09.0	06.3	08.9	06.5	11
12	10.2	06.4	10.1	06.5	10.0	06.7	09.9	06.7	09.8	06.9	09.7	07.0	12
13	11.0	05.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07.6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08.3	12.4	08.3	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.8	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	14.9	10.1	14.7	10.3	14.6	10.6	18
19	16.1	10.1	15.9	10.3	15.8	10.6	15.8	10.6	15.6	10.9	15.4	11.2	19
20	17.0	10.6	16.8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.7	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.1	12.9	18.8	13.2	18.6	13.5	23
24	20.4	12.7	20.1	13.1	20.0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.8	13.9	20.7	14.0	20.5	14.3	20.2	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.6	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.7	14.8	23.5	15.2	23.3	15.6	23.2	15.7	22.9	16.1	22.7	16.5	28
29	24.6	15.4	24.3	15.8	24.1	16.1	24.0	16.2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24.3	17.6	30
31	26.3	16.4	26.0	16.9	25.8	17.2	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26.6	17.8	26.5	17.9	26.2	18.4	25.9	18.8	32
33	28.0	17.5	27.7	18.0	27.4	18.3	27.4	18.5	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29.0	19.6	28.7	20.1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20.1	30.8	20.6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21.1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22.4	31.6	22.9	39
40	33.9	21.2	33.6	21.8	33.3	22.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34.1	22.8	34.0	22.9	33.6	23.5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.8	23.9	35.6	24.0	35.2	24.7	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36.5	24.6	36.0	25.2	35.6	25.9	44
45	38.2	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.5	45
46	39.0	24.4	38.6	25.1	38.2	25.6	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38.5	27.0	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28.2	48
49	41.6	26.0	41.1	26.7	40.7	27.2	40.6	27.4	40.1	28.1	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27.8	41.4	28.0	41.0	28.7	40.4	29.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	58 Deg.		57 Deg.		5 point		56 Deg.		55 Deg.		54 Deg.		

Dist.	32 Deg.		33 Deg.		3 Point		34 Deg.		35 Deg.		36 Deg.		Dist.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
51	43.2	27.0	42.8	27.8	42.4	28.3	42.3	28.5	41.8	29.3	41.3	30.0	51
52	44.1	27.6	43.6	28.3	43.2	28.9	43.1	29.1	42.6	29.8	42.1	30.6	52
53	44.9	28 1	44 5	28.9	44.1	29.4	43.9	29.6	43.4	30.4	42.9	31.2	53
54	45.8	28.6	45.3	29.4	44.9	30.0	44.8	30.2	44.2	31.0	43.7	31.7	54
55	46.6	29.1	46.1	30.0	45.7	30.6	45.6	30.8	45.1	31.5	44.5	32.3	55
56	47.5	29.7	47.0	30.5	46.6	31.1	46.4	31.3	45.9	32.1	45.3	32.9	56
57	48.3	30.2	47.8	31.0	47.4	31.7	47.3	31.9	46.7	32.7	46.1	33.5	57
58	49.2	30.7	48.6	31 6	48.2	32.2	48.1	32 4	47.5	33.3	46.9	34.1	58
59	50.0	31.3	49.5	32.1	49.1	32.8	48.9	33.0	48.3	33.8	47.7	34.7	59
60	50.9	31 8	50.3	32 7	49.9	33.3	49.7	33.6	49.2	34.4	48.5	35.3	60
61	51.7	32.3	51.2	33.2	50.7	33.9	50.6	34.1	50.0	35.0	49 3	35.9	61
62	52.6	32.8	52.0	33.8	51.6	34.4	51.4	34.7	50 8	35.6	50.2	36.4	62
63	53.4	33.4	52.8	34.3	52.4	35.0	52.2	35.2	51.6	36.1	51.0	37.0	63
64	54.3	33.9	53.7	34.9	53.2	35.6	53.1	35.8	52.4	36 7	51.8	37.6	64
65	55 1	34.4	54.5	35.4	54.0	36.1	53.9	36.3	53.2	37.3	52.6	38.2	65
66	56.0	35.0	55.4	35.9	54.9	36.7	54.7	36.9	54.1	37.9	53.4	38.8	66
67	56.8	35.5	56.2	36.5	55.7	37.2	55.5	37.5	54.9	38.4	54.2	39.4	67
68	57.7	36.0	57.0	37.0	56.5	37.8	56.4	38.0	55.7	39.0	55.0	40.0	68
69	58.5	36 6	57.9	37.6	57.4	38.3	57.2	38.6	56.5	39.6	55.8	40.6	69
70	59.4	37.1	58.7	38.1	58.2	38.9	58.0	39.1	57.3	40 2	56.6	41.1	70
71	60.2	37.6	59.5	38.7	59.0	39.4	58.9	39.7	58.2	40.7	57.4	41.7	71
72	61.1	38.2	60.4	39.2	59.9	40.0	59.7	40.3	59.0	41.3	58.2	42.3	72
73	61.9	38.7	61.2	39.8	60.7	40.6	60.5	40.8	59.8	41.9	59.1	42.9	73
74	62.8	39.2	62.1	40.3	61.5	41.1	61.3	41.4	60.6	42.4	59.9	43.5	74
75	63.6	39.7	62.9	40.8	62.4	41.7	62.2	41.9	61.4	43.0	60.7	44.1	75
76	64.4	40.3	63.7	41.4	63.2	42.2	63.0	42.5	62.3	43.6	61.5	44.7	76
77	65.3	40.8	64.6	41.9	64.0	42.8	63.8	43.1	63.1	44.2	62.3	45.3	77
78	66.1	41.3	65.4	42.5	64.9	43.3	64.7	43.6	63.9	44.7	63.1	45.8	78
79	67.0	41.9	66.3	43.0	65.7	43.9	65.5	44.2	64.7	45.3	63.9	46.4	79
80	67.8	42.4	67.1	43.6	66.5	44.4	66.3	44.7	65.5	45.9	64.7	47.0	80
81	68.7	42.9	67.9	44 1	67.4	45.0	67.1	45.3	66.4	46.5	65.5	47.6	81
82	69.5	43.4	68.8	44.7	68.2	45.6	68.0	45.9	67.2	47.0	66.3	48.2	82
83	70.4	44.0	69.6	45.2	69.0	46.1	68.8	46.4	68.0	47.6	67.1	48.3	83
84	71.2	44.5	70.5	45.7	69.8	46.7	69.6	47.0	68.8	48.2	68.0	49.4	84
85	72.1	45.0	71.3	46.3	70.7	47.2	70.5	47.5	69.6	48.8	68.8	50.0	85
86	72.9	45.6	72.1	46.8	71.5	47.8	71.3	48.1	70.5	49.3	69.6	50.5	86
87	73.8	46.1	73.0	47.4	72.3	48.3	72.1	48.6	71.3	49.9	70.4	51.1	87
88	74.6	46.6	73.8	47.9	73.2	48.9	73.0	49.2	72.1	50.5	71.2	51.7	88
89	75.5	47.2	74.6	48.5	74.0	49.4	73.8	49.8	72.9	51.0	72.0	52.3	89
90	76.3	47.7	75.5	49.0	74.8	50.0	74.6	50.3	73.7	51.6	72.8	52.9	90
91	77.2	48.2	76.3	49.6	75.7	50.6	75.4	50.9	74.5	52.2	73.6	53.5	91
92	78.0	48.7	77.2	50.1	76.5	51.1	76.3	51.4	75.4	52 8	74.4	54 1	92
93	78.9	49.3	78.0	50.6	77.3	51.7	77.1	52.0	76.2	53.3	75.2	54.7	93
94	79.7	49.8	78.8	51.2	78.2	52.2	77.9	52.6	77.0	53.9	76.0	55.3	94
95	80.6	50.3	79.7	51.7	79.0	52.8	78.8	53.1	77.8	54.5	76.9	55.8	95
96	81.4	50.9	80.5	52.3	79.8	53.3	79.6	53.7	78 6	55.1	77.7	56.4	96
97	82.3	51.4	81.4	52.8	80.7	53.9	80.4	54.2	79 5	55.6	78.5	57.0	97
98	83.1	51.9	82.2	53.4	81.5	54.4	81.2	54.8	80.3	56.2	79.3	57.6	98
99	84.0	52.5	83.0	53.9	82.3	55.0	82.1	55.4	81.1	56.8	80.1	58.2	99
100	84.8	53.0	83.9	54.5	83.1	55.6	82.9	55.9	81.9	57.4	80.9	58.8	100
	Dep	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	
Dist.	58 Deg.		57 Deg.		5 Point		56 Deg.		55 Deg.		54 Deg.		Dist.

Dist.	3¼ Point		37 Deg.		38 Deg.		39 Deg.		3½ point		40 Deg.		Dist.
	Lat	*Dep*	Lat	*Dep*	Lat	*Dep*	Lat	*Dep*	Lat	*Dep*	Lat	*Dep*	
1	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.6	01.2	01.6	01.2	01.6	01.2	01.6	01.3	01.5	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.2	02.5	03.1	02.5	03.1	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	03.9	03.1	03.9	03.1	03.9	03.2	03.8	03.2	5
6	04.8	03.6	04.8	03.6	04.7	03.7	04.7	03.8	04.6	03.8	04.6	03.9	6
7	05.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	06.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	05.6	08.8	05.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.5	07.4	09.3	07.6	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.0	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.6	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.2	11.7	09.4	11.6	09.5	11.5	09.6	15
16	12.9	09.5	12.8	09.6	12.6	09.9	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.7	10.1	13.6	10.2	13.4	10.5	13.2	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	14.0	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.1	14.6	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.3	15.5	12.6	15.5	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12.6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.9	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.6	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.6	15.2	18.4	15.4	24
25	20.1	15.0	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.6	21.6	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.5	22.9	17.9	22.5	18.2	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.1	23.6	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.7	24.4	19.1	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.1	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.6	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.3	27.2	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	28.0	21.1	27.6	21.5	27.2	22.0	27.1	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.2	28.0	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.6	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.2	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	27.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	28.9	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	36.3	29.8	36.0	30.2	47
48	38.6	28.6	38.3	28.9	37.8	29.6	37.3	30.2	37.1	30.5	36.8	30.9	48
49	39.4	29.2	39.1	29.5	38.6	30.2	38.1	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	39.9	30.1	39.4	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
Dist.	*Dep*	Lat	*Dep*	Lat	*Dep*	Lat	*Dep*	Lat	*Dep*	Lat	*Dep*	Lat	Dist.
	4¾ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

Dist.	3¼ Point		37 Deg.		38 Deg.		39 Deg		3½ Point		40 Deg.		Dist.
	Lat.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	41.0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39.4	32.4	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41.0	32.0	40.4	32.7	40.2	33.0	39.8	33.4	52
53	42.6	31.6	42.3	31.9	41.8	32.6	41.2	33.4	41.0	33.6	40.6	34.1	53
54	43.4	32.2	43.1	32.5	42.6	33.2	42.0	34.0	41.7	34.3	41.4	34.7	54
55	44.2	32.8	43.9	33.1	43.3	33.9	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45.0	33.4	44.7	33.7	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	34.0	45.5	34.3	44.9	35.1	44.3	35.9	44.1	36.2	43.7	36.6	57
58	46.6	34.5	46.3	34.9	45.7	35.7	45.1	36.5	44.8	36.8	44.4	37.3	58
59	47.4	35.1	47.1	35.5	46.5	36.3	45.8	37.1	45.6	37.4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36.7	48.1	37.6	47.4	38.4	47.2	38.7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.5	39.9	62
63	50.6	37.5	50.3	37.9	49.6	38.8	49.0	39.6	48.7	40.0	48.3	40.5	63
64	51.4	38.1	51.1	38.5	50.4	39.4	49.7	40.3	49.5	40.6	49.0	41.1	64
65	52.2	38.7	51.9	39.1	51.2	40.0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.6	42.4	66
67	53.8	39.9	53.5	40.3	52.8	41.3	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52.8	42.8	52.6	43.1	52.1	43.7	68
69	55.4	41.1	55.1	41.5	54.4	42.5	53.6	43.4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.1	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	43.7	55.2	44.7	54.9	45.0	54.4	45.6	71
72	57.8	42.9	57.5	43.3	56.7	44.3	56.0	45.3	55.7	45.7	55.2	46.3	72
73	58.6	43.5	58.3	43.9	57.5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44.5	58.3	45.6	57.5	46.6	57.2	46.9	56.7	47.6	74
75	60.2	44.7	59.9	45.1	59.1	46.2	58.3	47.2	58.0	47.6	57.4	48.2	75
76	61.0	45.3	60.7	45.7	59.9	46.8	59.1	47.8	58.7	48.2	58.2	48.9	76
77	61.8	45.9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	62.6	46.5	62.3	46.9	61.5	48.0	60.6	49.1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	62.3	48.6	61.4	49.7	61.1	50.1	60.5	50.8	79
80	64.3	47.7	63.9	48.1	63.0	49.3	62.2	50.3	61.8	50.8	61.3	51.4	80
81	65.1	48.3	64.7	48.7	63.8	49.9	62.9	51.0	62.6	51.4	62.0	52.1	81
82	65.9	48.8	65.5	49.3	64.6	50.5	63.7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49.4	66.3	49.9	65.4	51.1	64.5	52.2	64.2	52.7	63.6	53.4	83
84	67.5	50.0	67.1	50.6	66.2	51.7	65.3	52.9	64.9	53.3	64.3	54.0	84
85	68.3	50.6	67.9	51.2	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
86	69.1	51.2	68.7	51.8	67.8	52.9	66.8	54.1	66.5	54.6	65.9	55.3	86
87	69.9	51.8	69.5	52.4	68.6	53.6	67.6	54.7	67.3	55.2	66.6	55.9	87
88	70.7	52.4	70.3	53.0	69.3	54.2	68.4	55.4	68.0	55.8	67.4	56.6	88
89	71.5	53.0	71.1	53.6	70.1	54.8	69.2	56.0	68.8	56.5	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.9	56.6	69.6	57.1	68.9	57.9	90
91	73.1	54.2	72.7	54.8	71.7	56.0	70.7	57.3	70.3	57.7	69.7	58.5	91
92	73.9	54.8	73.5	55.4	72.5	56.6	71.5	57.9	71.1	58.4	70.5	59.1	92
93	74.7	55.4	74.3	56.0	73.3	57.3	72.3	58.5	71.9	59.0	71.2	59.8	93
94	75.5	56.0	75.1	56.6	74.1	57.9	73.0	59.2	72.7	59.6	72.0	60.4	94
95	76.3	56.6	75.9	57.2	74.9	58.5	73.8	59.8	73.4	60.3	72.8	61.1	95
96	77.1	57.2	76.7	57.8	75.6	59.1	74.6	60.4	74.2	60.9	73.5	61.7	96
97	77.9	57.8	77.5	58.4	76.4	59.7	75.4	61.0	75.0	61.5	74.3	62.4	97
98	78.7	58.4	78.3	59.0	77.2	60.3	76.2	61.7	75.8	62.2	75.1	63.0	98
99	79.5	59.0	79.1	59.6	78.0	61.0	76.9	62.3	76.5	62.8	75.8	63.6	99
100	80.3	59.6	79.9	60.2	78.8	61.6	77.7	62.9	77.3	63.4	76.6	64.3	100
Dist.	Dep.	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	4¾ Point		53 Deg.		52 Deg		51 Deg.		4½ point		50 Deg.		

A Table of DIFFERENCE.

Dist.	41 Deg.		42 Deg.		3¾ Point		43 Deg.		44 Deg.		4 point		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01.3	01.5	01.4	01.4	01.4	01.4	01.4	2
3	02.3	02.0	02.2	02.0	02.2	02.0	02.2	02.0	02.2	02.1	02.1	02.1	3
4	03.0	02.6	03.0	02.7	03.0	02.7	02.9	02.7	02.9	02.8	02.8	02.8	4
5	03.8	03.3	03.7	03.3	03.7	03.4	03.7	03.4	03.6	03.5	03.5	03.5	5
6	04.5	03.9	04.5	04.0	04.4	04.0	04.4	04.1	04.3	04.2	04.2	04.2	6
7	05.3	04.6	05.2	04.7	05.2	04.7	05.1	04.8	05.0	04.9	04.9	04.9	7
8	06.0	05.2	05.9	05.4	05.9	05.4	05.9	05.5	05.8	05.6	05.7	05.7	8
9	06.8	05.9	06.7	06.0	06.7	06.0	06.6	06.1	06.5	06.3	06.4	06.4	9
10	07.5	06.6	07.4	06.7	07.4	06.7	07.3	06.8	07.2	06.9	07.1	07.1	10
11	08.3	07.2	08.2	07.4	08.2	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07.9	08.9	08.0	08.9	08.1	08.8	08.2	08.6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	08.7	09.6	08.7	09.5	08.9	09.3	09.0	09.2	09.2	13
14	10.6	09.2	10.4	09.4	10.4	09.4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12.1	10.5	11.9	10.7	11.9	10.7	11.7	10.9	11.5	11.1	11.3	11.3	16
17	42.8	11.2	12.6	11.4	12.6	11.4	12.4	11.6	12.2	11.8	12.0	12.0	17
18	13.6	11.8	13.4	12.0	13.3	12.1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13.9	13.0	13.7	13.2	13.4	13.4	19
20	15.1	13.1	14.9	13.4	14.8	13.4	14.6	13.6	14.4	13.9	14.1	14.1	20
21	15.8	13.8	15.6	14.0	15.6	14.1	15.4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14.4	16.3	14.7	16.3	14.8	16.1	15.0	15.8	15.3	15.6	15.6	22
23	17.4	15.1	17.1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15.7	17.8	16.1	17.8	16.1	17.6	16.4	17.3	16.7	17.0	17.0	24
25	18.9	16.4	18.6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17.1	19.3	17.4	19.3	17.5	19.0	17.7	18.7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20.0	18.1	19.7	18.4	19.4	18.8	19.1	19.1	27
28	21.1	18.4	20.8	18.7	20.7	18.8	20.5	19.1	20.1	19.5	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.8	20.9	20.1	20.5	20.5	29
30	22.6	19.7	22.3	20.1	22.2	20.1	21.9	20.5	21.6	20.8	21.2	21.2	30
31	23.4	20.3	23.0	20.7	23.0	20.8	22.7	21.1	22.3	21.5	21.9	21.9	31
32	24.1	21.0	23.8	21.4	23.7	21.5	23.4	21.8	23.0	22.2	22.6	22.6	32
33	24.9	21.7	24.5	22.1	24.5	22.2	24.1	22.5	23.7	22.9	23.3	23.3	33
34	25.7	22.3	25.3	22.7	25.2	22.8	24.9	23.2	24.5	23.6	24.0	24.0	34
35	26.4	23.0	26.0	23.4	25.9	23.5	25.6	23.9	25.2	24.3	24.7	24.7	35
36	27.2	23.6	26.8	24.1	26.7	24.2	26.3	24.6	25.9	25.0	25.5	25.5	36
37	27.9	24.3	27.5	24.8	27.4	24.8	27.0	25.2	26.6	25.7	26.2	26.2	37
38	28.7	24.9	28.2	25.4	28.2	25.5	27.8	25.9	27.3	26.4	26.9	26.9	38
39	29.4	25.6	29.0	25.1	28.9	26.2	28.5	26.6	28.1	27.1	27.6	27.6	39
40	30.2	26.2	29.7	26.8	29.6	26.9	29.3	27.3	28.8	27.8	28.3	28.3	40
41	30.9	26.9	30.5	27.4	30.4	27.5	30.0	28.0	29.5	28.5	29.0	29.0	41
42	31.7	27.6	31.2	28.1	31.1	28.2	30.7	28.6	30.2	29.2	29.7	29.7	42
43	32.5	28.2	32.0	28.8	31.9	28.9	31.4	29.3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29.4	32.6	29.5	32.2	30.0	31.6	30.6	31.1	31.1	44
45	34.0	29.5	33.4	30.1	33.3	30.2	32.9	30.7	32.4	31.3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33.6	31.4	33.1	32.0	32.5	32.5	46
47	35.5	30.8	34.9	31.4	34.8	31.6	34.4	32.1	33.8	32.6	33.2	33.2	47
48	36.2	31.5	35.7	32.1	35.6	32.2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32.9	35.8	33.4	35.2	34.0	34.6	34.6	49
50	37.7	32.8	37.2	33.5	37.0	33.6	36.6	34.1	36.0	34.7	35.4	35.4	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	49 Deg		48 Deg.		4½ Point		47 Deg.		46 Deg		4 Point		Dist.

Diſt.	41 Deg.		42 Deg.		3¾ Point		43 Deg		44 Deg.		4 Point		Diſt.
	Lat.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	38.5	33.5	37.9	34.1	37.8	34.3	37.3	34.8	36.7	35.4	36.1	36.1	51
52	39.2	34.1	38.6	34.8	38.5	34.2	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38.1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	36.8	38.8	37.5	38.2	38.2	54
55	41.5	36.1	40.9	36.8	40.8	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42.3	36.7	41.6	37.5	41.5	37.6	41.0	38.2	40.3	38.9	39.6	39.6	56
57	43.0	37.4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	40.3	57
58	43.8	38.1	43.1	38.8	43.0	39.0	42.4	39.6	41.7	40.3	41.0	41.0	58
59	44.5	38.7	43.8	39.5	43.7	39.6	43.2	40.2	42.4	41.0	41.7	41.7	59
60	45.3	39.4	44.6	40.1	44.5	40.3	43.9	40.9	43.2	41.7	42.4	42.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.6	43.9	42.4	43.1	43.1	61
62	46.8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.6	43.1	43.8	43.8	62
63	47.5	41.3	46.8	42.2	46.7	42.3	46.1	43.0	45.3	43.8	44.5	44.5	63
64	48.3	42.0	47.6	42.8	47.4	43.0	46.8	43.6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.7	47.5	44.3	46.8	45.2	46.0	46.0	65
66	49.8	43.3	49.0	44.2	48.9	44.3	48.3	45.0	47.5	45.8	46.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44.6	50.5	45.5	50.4	45.7	49.7	46.4	48.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.3	50.5	47.1	49.6	47.9	48.8	48.8	69
70	52.8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50.4	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.6	47.7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.4	48.4	52.7	49.1	51.8	50.0	50.9	50.9	72
73	55.1	47.9	54.2	48.8	54.1	49.0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.8	48.6	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51.4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.9	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51.0	55.6	51.8	54.7	52.8	53.7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52.5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52.2	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.9	58.5	53.1	57.8	53.9	56.8	54.9	55.9	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58.5	54.6	57.5	55.6	56.6	56.6	80
81	61.1	53.1	60.2	54.2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	60.9	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60.7	56.6	59.7	57.7	58.7	58.7	83
84	63.4	55.1	62.4	56.2	62.2	56.4	61.4	57.3	60.4	58.4	59.4	59.4	84
85	64.1	55.8	63.2	56.9	63.0	57.1	62.2	58.0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57.8	62.9	58.7	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.6	58.2	64.5	58.4	63.6	59.3	62.6	60.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65.2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67.2	58.4	66.1	59.6	65.9	59.8	65.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66.9	60.2	66.7	60.4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.1	66.6	62.1	65.5	63.2	64.3	64.3	91
92	69.4	60.4	68.4	61.6	68.2	61.8	67.3	62.7	66.2	63.9	65.1	65.1	92
93	70.2	61.0	69.1	62.2	68.9	62.5	68.0	63.4	66.9	64.6	65.8	65.8	93
94	70.9	61.7	69.9	62.9	69.7	63.1	68.8	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62.3	70.6	63.6	70.4	63.8	69.5	64.8	68.3	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.2	69.8	67.4	68.6	68.6	97
98	74.0	64.3	72.8	65.6	72.6	65.8	71.7	66.8	70.5	68.1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.0	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
Diſt.	Dep.	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diſt.
	49 Deg.		48 Deg.		4¼ Point		47 Deg.		46 Deg.		4 point		

The Uſe and Explanation of the Table of Difference *of* Latitude *and* Departure.

THIS is a Table larger and better contriv'd than any of this Nature yet extant, giving the Difference of Latitude and Departure in Minutes and Tenths, and to any Diſtance not exceeding 100 Minutes to every Degree and Quarter point of the Compaſs; and may be uſed to a greater Diſtance being taken out at twice or thrice according to the Quantity of the Diſtance as ſhall be ſhewn in the Uſe.

The Courſe ſtands at the Head and Foot of the Table, to every Deg. and Quarter point of the Compaſs; at the Head it begins at 1 deg. ſo 2 deg $\frac{1}{4}$ point, *&c.* encreaſing to 45 deg. or 4 Points. At the Foot it begins at 45 deg. or 4 Points, ſo 46 deg. 47 deg. 4$\frac{1}{4}$ Points, *&c.* encreaſing backwards to 90 deg. or 8 Points. The Diſtance ſtands in the two outmoſt Columns under the Title *Diſt.* which on the Left-hand Page begins at 1 and runs to 50; on the Right-hand Page it begins at 51, and runs to 100, the Difference of Latitude and Departure ſtands under the Courſe at the Head, and over it at the Foot of the Table.

The USE *of the Table.*

This Table is very uſeful in Navigation, eſpecially in working a *Traverſe*

Example 1. The Courſe and Diſtance given, to find the Difference of Latitude and Departure by the Table.

Suppoſe a Ship ſails NNE. $\frac{3}{4}$ E. 95 Miles, and the Difference of Latitude and Departure required.

On the Right hand Page (becauſe the Diſtance is above 50) and at the top (becauſe it is leſs than 4 Points) look for 2$\frac{3}{4}$ Points, which is the Courſe; under which, and againſt 9.5 the Diſtance, and under the Title *Lat.* ſtands 81.5, which is 81 min. $\frac{5}{10}$ the Difference of Latitude, and under the Title *Dep.* ſtands 48.8, which is 48 min. $\frac{8}{10}$ which is the Departure required.

Example 2. Suppoſe a Ship ſails South 56 deg. Weſterly 48 Miles, the Difference of Latitude and Departure required.

On the Left-hand Page (becauſe the Diſtance is leſs than 50) and at the bottom (becauſe it is more than 45d.) look for 56 d. the Courſe; over which, and againſt 48 the Diſtance, over the Title *Lat.* ſtands 26.8 that is 26 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* ſtands 39.8, that is 39 min. $\frac{8}{10}$ the Departure required.

Example 3. Suppoſe a Ship ſail North Weſt by North 160 Miles, and the Difference of the Latitude and Departure required by the Table.

On the Right-hand Page at the top, look for 3 Points, the Courſe. Now becauſe the Table goes but to 100, take for 100 firſt; therefore under 3 Points, and againſt 100, under the Title *Lat.* ſtands 83.1 that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* ſtands 55.6, that is 55 min $\frac{6}{10}$ the Departure; then for 60 under 3 Points, and againſt 60, under the Title *Lat.* ſtands 49.9, that is 49 min. $\frac{9}{10}$ the Diff. of Latitude, and under the Title *Dep.* ſtands 33.3, that is 33 min. $\frac{3}{10}$ the Departure, then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, the Sum is 133 min. the Difference of Latitude, and 88 $\frac{9}{10}$ the Departure required.

This Table is alſo uſeful in the Reſolution of the reſt of the Problems of *Plain Sailing*, which for Brevity ſake are omitted here, being taught at large, in the laſt Edition of *Practical Navigation*; but the general Uſe of it is in the exact working of a Traverſe.

Example 1. Suppoſe a Ship bound to a certain Port, ſails SE. by S. 49 min. then ESE. ½ E. 52 min. then E by N ½ E. 62 min. then SSW ½ W 57 min. then S ½ E. 39 min. to find the Difference of Latitude and Departure the Ship hath made.

Set down the ſeveral Courſes and Diſtances; firſt allowing for Leeway if any; then proceed to look out the Difference of Latitude and Departure for each Courſe and Diſtance (by the Directions before given in the Table placing them in their proper Columns, (*viz.*) If the Courſe be Northerly, the Difference of Latitude muſt be put in the North Column, if S.erly, in the South Column; If the Departure be E.erly, it muſt be put in the Eaſt Column; if W.erly in the Weſt Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and ſubtract the leſſer Difference of Latitude and Departure from the greater, and the Remainder is the Difference of Latitude and Departure.

The Table.

Courſes	*Diſtances*	*Diff. of Lat.*		*Departure.*	
		North	*South*	*Eaſt*	*Weſt*
S E by S	49		40.7	27.2	
E S E ½ E.	52		15.1	49.8	
E by N ½ E	62	06.1		61.7	
S S W ½ W	57		50.3		26.9
S ½ E.	39		38.8	03.8	
		06.1	144.9	142.5	26.9
			06.1	26.9	
			138.8	115.6	

The whole Differ. of Lat. is 138 $\frac{8}{10}$ S. the Dep. 115 $\frac{6}{10}$ E. then to find the Courſe and Diſt. find the Lat. and Dep. in their proper Columns, but the Tables not extending ſo far, I take half of each, *viz.* half the Diff. of Lat. 69.4 and half the Dep. 57.8 the neareſt to which, in the Columns of Lat. and Dep. in the Traverſe Table is 69.6 and 57.1, over which, at the Top I find 3½ Points for the Courſe South Eaſterly, or SE½ S. and in the Column of Diſt. 90, which doubled (becauſe I took half the two Numbers) is 180 the Diſtance required.

Example.

Examp. 2. The Courſes being given in Deg. which often happens by reaſon of allowance for the Variation of the *Compaſs*, and in the like Caſes.

Suppoſe a Ship bound to a certain Port, ſails 65 Miles North, 34 deg. Weſterly. Then 56 Miles North, 67 deg Weſterly. Then 48 Miles South, 78 degrees Weſterly. Then 54 Miles North, 23 deg. Eaſterly. Then 36 Miles North, 6 deg. Eaſterly, and the Difference of Latitude and Departure required.

The Table.

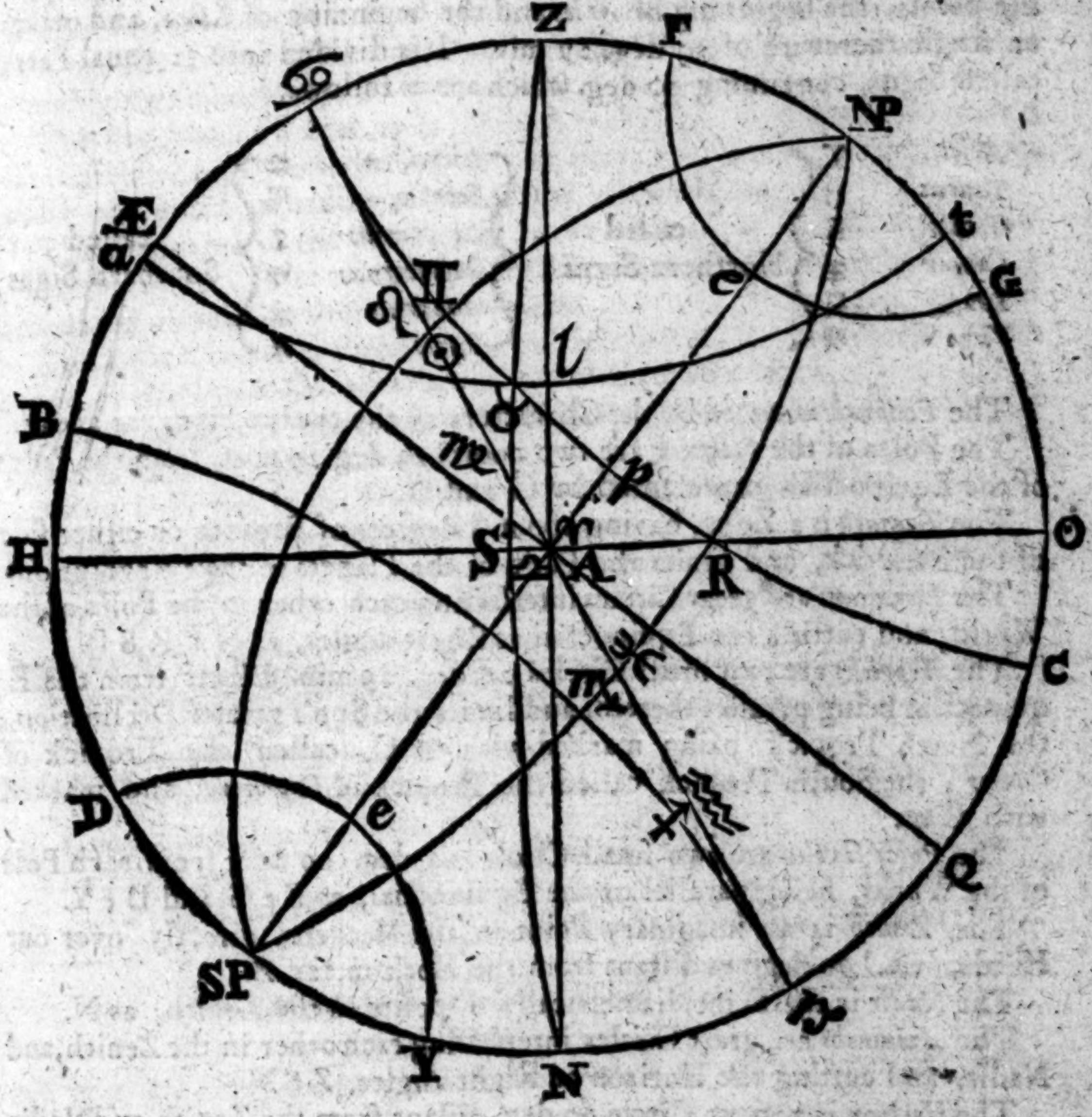
Courſe		*Diſtance*	*Diff. of Lat*		*Departure.*	
			North	*South*	*Eaſt*	*Weſt*
N W	34°	65	53.9			36,3
N W	67°	56	21.9			51.5
S W	78°	48		10.0		47.0
N E	23°	54	49.7		21.1	
N E	6°	36	35.8		03.8	
			161.3	10.0	24.9	134.8
			10.0			24.9
			151.3			109.9

The whole Difference of Latitude is $151\frac{3}{10}$ North, the Departure $109\frac{9}{10}$ Weſt. The Courſe and Diſtance is found as in the laſt Example.

But if you would keep a Reckoning both in Latitude and Longitude, you may alſo find the Difference of Longitude by the *Traverſe Table*, (according to *Middle Latitude* Sailing) thus: Find the Complement of Middle Latitude in the Degrees, at the Top or Bottom of the Table, and under or above that in the Column of Departure; find your Departure, and right againſt that, in the Column of Diſtance, you have the Difference of Longitude.

Examp. Suppoſe in the laſt Inſtance of a *Traverſe*, the Ship hath ſailed from Latitude 50 deg. 00 min. North; then becauſe the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is, 52 deg. 31 min. and conſequently the Middle Latitude is 51 deg. 16 min. its Complement 38 deg. 44 min. which being neareſt 39 deg. I look for 39 at the Head of the Table, and under it in the Column of Dep. I look for the Departure 110, but the Table not proceeding ſo far, I take its half, *viz.* 55, the neareſt to which in the Table, is 54.8 (being leſs) againſt which, in the Column of Diſtance is 87, which doubled (becauſe I took half the Departure) the Sum 174 min. or 2° 54′ is the Difference of

Longitude required, which is ſufficiently exact for common practice; only I would adviſe all Perſons for avoiding as much as poſſible any Error, that every time the Reckoning is Corrected by an Obſervation, the Longitude be alſo Corrected according to *Mercator's* Sailing, as you are taught in the laſt Edition of Practical Navigation.



Some neceſſary Aſtronomical Definitions.

THE Poles of the Equinoctial (commonly called the Poles of the World) are two fixed Points in the Heavens, oppoſite one to another; the one viſible to us, called the North Pole, marked with the Letters NP; the other not viſible to us, called the South Pole, marked with SP.

The *Axis* of the World is a Line imagined to paſs from Pole to Pole, about which is performed; the diurnal Revolution, as the Line NPASP.

The *Equinoctial* is a great Circle 90 deg. diſtant from the Poles of the World, and divides the Globe into the North and South Hemiſpheres; it is noted by the Letters ÆAQ.

The *Eclipticк* is a great Circle interſecting the Equinoctial in two oppoſite points, the beginning of *Aries* and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 29 min. It is divided into 12 equal Parts, called Signs, containing 30 deg. which are as follows,

Aries	♈	called Northern Signs	*Libra,*	♎	called Southern Signs
Taurus	♉		*Scorpio,*	♏	
Gemini	♊		*Sagittarius*	♐	
Cancer	♋		*Capricornus*	♑	
Leo	♌		*Aquarius*	♒	
Virgo	♍		*Piſces*	♓	

The *Ecliptick* is noted by the Characters of the twelve Signs, as above.

The Poles of the *Ecliptick* are two points 23 deg 29 min. from the Poles of the Equinoctial, repreſented by G and D.

The *Zodiack* is a Zone, having about 8 degrees of Breadth on either ſide of the Ecliptick, and limits the Latit. of the Planets in their Revolutions.

The *Meridians* are great Circles interſecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles, as N P R S P.

The *Tropicks* are two ſmall Circles 23 deg. 29 min. diſtant from the Equinoctial being parallel thereto, and limits the Sun's greateſt Declination; the North Tropick being marked with ♋ C, called the Tropick of *Cancer*; the South Tropick called the Tropick of *Capricorn*, and marked with B ♑.

The *Polar Circles* are two ſmall Circles 23 deg. 29 min, from each Pole of the World, being parallel to the Equinoctial, as F e G and D e Y.

The *Zenith* is an imaginary Point in the Heavens, directly over our Heads, *(viz.)* 90 degrees diſtant from the Horizon, as *Z*.

The *Nadir* is the Point diametrically oppoſite to the Zenith, as N.

The *Azimuths* are great Circles interſecting each other in the Zenith, and Nadir, and cutting the Horizon at Right angles, Z S N.

The *Horizon* is a great Circle 90 deg. diſtant from the Zenith and Nadir, and divides the World into the Viſible and Inviſible Hemiſpheres, as HAO.

The *Meridian* of a Place, is that Meridian that paſſeth by the Zenith and the Nadir of the ſaid Place, and is repreſented by the Circle Z N P O Q N S P H Æ Z.

Parallels of Altitude, or *Almicanters*, are ſmall Circles parallel to the Horizon, imagined to paſs through any degree of Altitude between the Horizon and the Zenith, as a l t.

Parallels of Declination, or *Latitude*, are ſmall Circles parallel to the Equinoctial, and are called Parallels of Declination, with reſpect to the Heavens, and Parallels of Latitude reſpecting the Earth, as ♋PRC.

Circles of Longitude in the Heavens, are great Circles interſecting each other in the Poles of the Ecliptick, and interſecting the Ecliptick at Right Angles, as NP☉SP.

The *Latitude* of a Star is an Arch of a Circle of Longitude, contained between the Center of the Star and the Ecliptick, and is accounted either Northerly or Southerly,

The *Longitude* of a Star, is an Arch of the Ecliptick, contained between the Circle of Longitude paſſing by the Star, and the beginning of *Aries*, and is accounted according to the Order of the Signs.

The *Declination* of the Sun or Star, is an Arch of the Meridian, contained between the Center of the Sun or Star, and the Equinoctial, and is accounted either Northerly or Southerly.

The *Right Aſcenſion* is that Degree and Minute of the Equinoctial, that comes to the Meridian with the Center of the Sun or Star.

Oblique Aſcenſion is the Degree and Minute of the Equinoctial, that riſeth with the Center of the Sun or Star.

Oblique Deſcenſion is the Degree and Minute of the Equinoctial, that ſets with the Center of the Sun or Star.

Aſcenſional Difference is an Arch of the Equinoctial, contained between the Right and Oblique Deſcenſion, or Aſcenſion, or it is the Difference of Time between the Sun Riſing or Setting, and Six a Clock.

The *Amplitude*, is an Arch of the Horizon, being the Diſtance of the Riſing or Setting of the Sun or Star from the Eaſt and Weſt, and is accounted either Northerly or Southerly.

The Latitude of a Place is the height of the Pole above the Horizon, or the diſtance between the Zenith and the Equinoctial.

Longitude on the Earth, is an Arch of the Equinoctial, contained between the Meridian of the Place where the Longitude is aſſigned to begin, and the Meridian of any other Place, and is counted Eaſterly and Weſterly,

Aſtronomical Problems uſeful in Navigation

PROBLEM I.

THE Sun's Place and greateſt Declination given, to find its preſent Declination.

Example.

Suppoſe the Sun's Place to be 20d. 30m. of *Gemini*, the greateſt Declination is 23d. 29m. it is required to find the preſent Declination.

The Operation by the Logarithms.

As Radius	10.000000
Is to S. Sun's greateſt Declination 23d. 29m.	9.600409
So is S. Sun's Longitude 80d. 30m. from *Aries*	9.994003
To S. Sun's preſent Declination 23d. 10m, North	19,594412

By the Gunter.

The Extent from Radius S 90°, to S 23° 29′, ſhall reach from S. 80° 30′ to the S. 23° 10′ the Sun's *Declination* North becauſe in a Northern Sign

Note; The Sun's Long. is reckoned from the next Equinoctial Point, Therefore if the Sun be in *Aries*, *Taurus*, *Gemini*, *Capricornus*, *Aquarius* or *Piſces*, the Longitude is accounted from *Aries*; but if in *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, it is accounted from *Libra*.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, are called Northern Signs; *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius*, and *Piſces*, are called Southern Signs. Conſequently, if the Sun's Place be in any of the firſt ſix Signs the Declination is North; but if in any of the latter ſix, the Declination is South.

PROB. II.

The Sun's greateſt Declination and preſent Declination given, to find his Place.

Example.

The Sun's greateſt Declination is 23° 29′; and preſent Declination is 18° 30′ North increaſing, the Sun's Place required.

By the Logarithms.

As the S. of the Sun's greateſt Declination 23° 29′	9.600409
To Radius	10.000000
So is the Sine of the preſent Declination 18° 30′ North	9.501476
To the Sine Sun's Longitude 52° 46′	9.901067

That is one Sign (30° making a Sign) and 22° 46′ from *Aries*, becauſe the Declination is North and increaſing, that is 22° 47′ of *Taurus*; but if the Declination had been North decreaſing, it muſt have been accounted from *Libra*, and then it would have been 7° 14′ in *Leo*.

By the Gunter.

The Extent of the Compaſſes from the Sine 23° 29′ the greateſt Declination, to Radius S. 90° ſhall reach from S. 18° 30′. the Sun's preſent Declination, to S. 52° 45′ the Sun's Longitude as above.

PROB. III.

The Sun's Place and greateſt Declination given, to find the Right Aſcenſion.

Example

The Sun's Place 10° 30′ in *Aquarius*, and the Right Aſcenſion required.

The Operation by the Logarithms.

As Radius	10.000000
To the Tangent of the Sun's Longitude from *Aries* 49° 30′	10.068501
So is the Sc. of the greateſt Declination 23° 29′	9.962453
To the Tangent of Sun's Right Aſcenſion 47° 2′	10.030954

By the Gunter.

The Extent from Radius S. 90° to Sc. of the greateſt Declination 66° 31′, ſhall reach from Tangent Sun's Longitude from *Aries* 49° 30′ to Tangent Right Aſcenſion 47° 2′ required.

Note; This Proportion gives the Sun's Right Aſcenſion from the next Equinoctial Point; but it ought to be accounted from *Aries*, according to the Order and Succeſſion of the Signs and therefore in this Caſe 47° 02′ ſubtracted from 360d. gives 312d. 58m the Right Aſcenſion from *Aries*.

PROB. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude.

Example.

The Latitude 51d. 32m. North, and the Sun's Declination 15d. 20m. North, what is the Amplitude?

The Operation by the Logarithms

As Sc of the Latitude 51d. 32m. —— 9.793832

To Radius —— 10.000000

So is S. of the Declination 15d. 20m North —— 9.422318

To the S. of the Sun's Amplitude 25d. 9m. —— 9.628486

By the Gunter.

The Extent from the Sc. of the Latitude 38d. 28m. to the Sine of the Declination 15d. 20m. North, ſhall reach from Radius S. 90d. to S. 25d. 9m. the Sun's Amplitude. North as, above.

Note; If the Declination be North, the Amplitude is North, and if the Declination be South, the Amplitude is alſo South.

PROB. V.

The Latitude of a Place, and the Sun's Declination given, to find the Aſcenſional Difference.

Example.

Suppoſe in the Latitude 51 deg. 32 min. North, the Sun's Declination is 10 deg. 45 min. North, and the Aſcenſional Difference required.

The Operation by the Logarithms.

As Tangent Complement Latitude 51 deg. 32 min. —— 9.900085

To Radius —— 10.000000

So is the Tangent of the Sun's Declination 10d. 45m. —— 9.278424

To S. of the Aſcenſional Difference 13° 49′ —— 9.378339

By the Gunter.

The Extent from Tangent 38° 28′ (the Comp. of Latitude) to Tangent 10 deg. 45 min. the Sun's Declination, ſhall reach from Radius S. 90d. to S, 13 deg. 50m. the Sun's Aſcenſional Difference, as above.

PROB. VI.

To find the Oblique Aſcenſion and Deſcenſion.

Firſt, Find the Aſcenſional Difference by the fifth Problem.

Secondly, the Right Aſcenſion by the third Problem.

Then if the Sun's Declination be North, the Aſcenſional Difference ſubtracted from the Right Aſcenſion, gives the Oblique Aſcenſion, and added thereto, gives the Oblique Deſcenſion. But if the Sun's Declination be South, the Aſcenſional Difference added to the Right Aſcenſion, gives the Oblique Aſcenſion, and ſubtracted gives the Oblique Deſcenſion

Note; That if the Aſcenſional Difference exceed the Right Aſcenſion, add to the Right Aſcenſion 360 Degrees, then ſubtract the Aſcenoſinal Difference therefrom.

Or if both being added together exceed 360d. the Exceſs is the Oblique Aſcenſion or Deſcenſion.

PROB. VII.

To find the time of the ☉ riſing or ſetting, and length of the Day or Night

Find the Aſcenſional Difference by the fifth Problem, which converted into Hours and Minutes of Time, accounting for 15 deg. of the Equinoctial one Hour, and for every Degree 4 Minutes of Time, and for every 15 Minutes of the Equinoctial 1 Minute of Time.

If the Sun's Declination be Northerly, the Aſcenſional Difference added to ſix Hours, gives the time of Sun-ſetting; and ſubtracted is the Time of Sun riſing.

If the Declination be Southerly, contrarily the Aſcenſional Difference added, gives the Time of Sun-riſing; ſubtracted is the Time of ſetting.

The Time of Sun-ſetting doubled gives the Length of the Day; the Time of Sun-riſing doubled, is the Length of the Night.

Example.

In Latitude 51d. 32m. North, ſuppoſe the Sun's Declination 21d. 57m North, the Aſcenſional Difference is 30d. 29m. which reduced into Time is

	H	M		H	M	
	2	02				
	6	00				
Sun ſetteth ———	8	02	doubled is	16	04	length of the Day
Sun riſeth ———	3	58		7	56	length of the Night.

PROB. VIII.

The Latitude of a Place, the Sun's Altitude and Declination given, to find the Azimuth required.

The Rule.

Take the Complement of the Altitude, the Compl. of the Latitude, and the Compl. of the Declination to 90 deg. add them together, and take the Half-ſum; ſubtract the Compl. of the Declination from the Half-ſum, and take the Remainder; then ſet down the Compl. Arithmetical of the Sines of the Compl. Altitude, and Compl. Latitude, and thereto add the Sines of the Half-ſum and Remainder, half the Sum of theſe four Logarithms is the Sc, of half the Azimuth required.

Note; If the Declination be South in North Latitude, or North in South Latitude, inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, and then proceed as before.

The Operation by the Logarithms.

° '
42 : 30 Compl. Altitude ——— ——— S. Co. Ar. 0.170319
38 : 28 Compl. Latitude——— ———S. Co. Ar. 0.206168
69 : 30 Compl. Declination
150 : 28 Sum
75 : 14 Half ſum——— ——— ———S.——9985414
5 : 44 Exceſs of the half ſum above c. Decl. S.——8.999599
Sum 19.361498
61d: 21m.——— Sc. ———Half Sum 9.680749
61d. 21m.

which doubled is 122d. 42m. the Sun's Azimuth from North required.

The Operation by Gunter's *Scale.*

The Extent of the Compaſſes from Radius S. 90 deg. to S. 42 deg. 30 min. the Complement of the Altitude, ſhall reach from S. 38 d. 28m. the Complement of the Latitude, to S. 24 deg. 40 min. then the Extent from Sine 24 deg. 40 min. to Sine 75 deg. 14 min. the Half ſum, ſhall reach from Sine 5 deg. 44 min. the Exceſs of the Halt ſum, above the Complement Declination to 122 deg. 42 min. (upon the Line of Verſed Sines) which is the Azimuth required.

Examp. 2. In the Latitude 51 deg. 32 min. North, the Sun's Declination is 18 deg. 15 min. South, his Altitude 17 deg. 45 min. and the Azimuth from the North required.

d m *The Operation by the Logarithms*
72 : 15 Compl. Altitude——— ——— ———S. Co. Ar. 0 021181
38 : 28 Compl. Latitude ——— ——— ———S. Co. Ar. 0.206168
108 : 15 Declination 90 deg. being added, becauſe South.
218 : 58 Sum
109 : 29 Half ſum Compl. to 180° is 70° 31′ S.——— ———9974381
1 : 14 Remainder——— ——— ——— S.——— ———8.332924
d m Sum 18.534655
79 20——— Sc.———Half ſum 9.267326
79 20

which doubled is——158 40 the Azimuth from the North required.

By the Gunter.

The Extent from Radius S. 90d. to the S. 72d. 15m. the Compl. Altitude, ſhall reach from the S. 38d. 28m the Complement Latitude, to the S. 36d. 20m. then the Extent from the S. 36d. 20m. to S. 70d. 31m. the Complement of 109d. 29 min. (the half Sum) to 180d. ſhall reach from the Remainder S. 1d. 14m. to 158d. 40m. (upon the Line of Verſed Sines) the Sun's Azimuth as above.

In South Latitude, the Operation is the ſame with the two preceeding Examples, only the Azimuth is found from the South.

After the ſame manner you may find the Azimuth of any Star.

PROB. IX. The Latitude of the Place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example. In the Latitude 51 deg. 32 min. North, ſuppoſe the Sun's Declination 23 deg. 29 min. North, the Altitude 36 deg. 30 min. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude to 90°, add them together, and take the half ſum, ſubtract the Complement of the Altitude from the half Sum, and take the Remainder, then ſet down the Complement Arithmetical of the Sine Complement of the Declination, and Complement Latitude, and thereto add the Sines of the Half ſum and Remainder: half the Sum of theſe four Logarithms, is the Sc. of half the Time required in Degrees and Minutes of the Equinoctial.

The Operation by the Logarithms,

d.	m			
66	31	Compl. Declination	S. Co. Ar.	0.037547
38	28	Compl. Latitude	S. Co. Ar.	0.206168
53	30	Compl. Altitude		
158	29	Sum		
79	14	Half-ſum	Sine	9.992287
25	44	Remainder	Sine	9.637673
d	m		Sum	19.183675
30	09	Sc	Half ſum	9.936837
30	09			

Which doubled is 60 18 and reduced into Time, makes 4 hours 1 min. $\frac{1}{5}$, the Hour of the Day Afternoon.

But if it had been in the Forenoon, 4 hours 1 min. $\frac{1}{5}$ ſubtracted from 12 hours, leaves 7 hours 58 min. $\frac{4}{5}$ for the Time in the Morning.

If the Declination had been ſoutherly, then inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, as in the ſecond Example of the Eighth Problem; do the ſame when the Declination is North in South Latitude.

By the Gunter.

The Extent of the Compaſſes from Radius S. 90° to S. 66° 31′ the Complement of the Declination, ſhall reach from S. 38° 28′ the Complement Latitude, to S. 34° 40′; then the Extent from S. 34° 40′ to the S. of 79° 14′, the half ſum, ſhall reach from S. 25° 34′ the Remainder, to 60° 15′ (upon the Line of Verſed Sines) the hour of the Day near as above.

PROB. X. Having the Latitude of the Place, the Sun's Right Aſcenſion, with the Right Aſcenſion, Declination, and Altitude of a Star given, to find the Hour of the Night.

Example

Example.

In the Latitude of 51 deg. 32 min. North, on the 7th of *January* 1729, the Sun's Right Aſcenſion is 20 hours 1 min. the Right Aſcenſion of the *Lyon's Tail* is 11 hours 31 min the Declination 16 deg 10 min. North, the Altitude 30 deg. 30 min. to the Eaſtward of the Meridian, the hour of the Night required.

The Rule.

Take the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Star's Altitude; add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and reſerve the Remainder: then ſet down the Complement Arithmetical of the Sines of the Complement of the Star's Declination and of the Latitude of the Place, and thereto add the Sines of the Half ſum and Remainder: Half the Sum of theſe four Logarithms, is the Sc. of half the Diſtance from the Meridian.

The Operation by the Logarithms.

°   ′
73 : 48 Compl. Star's Declination S. Co. Ar.——10.017596
38 : 28 Compl. Latitude——————S, Co. Ar. 0.206168
59 : 30 Compl. Star's Altitude,
171 : 46 Sum
85 : 53 Half ſum————Sine——9.998878
26 : 23 Remainder————Sine——9.647749
Sum 19.870291
38d. 32m.——Sc.——Half-ſum 9.935145
30d. 32m.

which doubled is 61d. 04m. and reduced into Time, gives four hours four Minutes 16 Seconds, or $\frac{1}{4}$ of a Minute.

By the Direction given in the Uſe of the Table of the Sun's Right Aſcenſion, and of the Right Aſcenſion and Declination of the Fixed Stars, find the Time of the Star's coming upon the Meridian, if the Star be to the Eaſtward of the Meridian, ſubtract the Star's Diſtance from the Meridian in Time, from the Time of the Star's coming upon the Meridian, but if the Star be to the Weſtward of the Meridian, add the Star's Diſtance from the Meridian, to the Time of the Star's coming on the Meridian; the Sum or Difference is the Hour of the Night. In this Example, The Sun's Right Aſcenſion 20 Hours 01 Minute ſubtracted from the Star's Right Aſcenſion (with 24 Hours added thereto) 35 Hours 31 Minutes; leaves 15 Hours 30 Minutes, the Time of the Star's coming on the Meridian; from which ſubtracting 4 Hours 4 Minutes leaves 11 Hours 27 Minutes; the Hour of the Night.

Note farther, If the *Star's* Declination be South in North Latitude, or North in South Latitude, inſtead of taking the Complement Declination, to 90 deg. there muſt be 90 deg. added thereto, as has been ſhewn in the Eighth proceeding Problem.

The Operation by Gunter's Scale.

The Extent of the Compaſſes from Radius S. 90° to the S, of 73 Degrees 48 Minutes the Complement of the Star's Declination, ſhall reach from S. 38 Degrees 28 Minutes the Complement of the Latitude, to the S. of 36 Degrees 40 Minutes; then the Extent from S. 36 Degrees 40 Minutes, to S. 85 Degrees 53 Minutes, the half Sum ſhall reach from S 26 Degrees 23 Minutes the Remainder, to 61 Degrees 05 Minutes (upon the Line of verſed Sines required.) With which proceed as has been directed to find the Hour of the Night.

Courſes and Diſtances between ſome of the moſt eminent Places on the Coaſt of England, *&c. As alſo the thwart Courſes between the Eaſt Coaſt of* England *and* Holland, *the South-Coaſt of* England *and* France, *and the Weſt Coaſt of* England *and* Ireland.

	Leag.
FROM *Whitby* to *Tinmouth*, N W by N	14
From *Bockneſs* to *Catneſs*, North Weſt	27
From the *North Foreland* to *Fluſhing*, Eaſt	24½
From the *North Foreland* to the *Texel*, North Eaſt	52
From the *Spurn* to the *Texel* Eaſt by South	56
From *Tinmouth* to the *Naze of Norway*, NE by E.	120
From *Tinmouth* to *Holy-Land*, Eaſt by South	116
From *Tinmouth* to the *Scaw*, E N E	110
From *Yarmouth* to the *Texel*, Eaſt by North	34
From *Newcaſtle* to *Maes-Deep*, E N E	83
From *Aberdeen* to *Maes-deep*, South Eaſt	113
From the *North Foreland* to the *Maes*, E N E	30
From *Newcaſtle* to the *Fly*, E S E	90
From *Scarborough* to *Holy-Land*, Eaſt Northerly	97
From the *Start* to the *Eddyſtone*, Weſt half South	06
From the *Lands-end* to *Silly*, Weſt South Weſt ¾ Weſt	09
From the *Caſkets* to *Blackneſs*, Eaſt North Eaſt	55
From *Beachy* to *Blackneſs*, Eaſt a quarter North	15

From

From *Dover* to *Diep*, South half Weſt	25
From the *Lizard* to *Guernſey*, Eaſt by South	35
From the *Start* to *Seven Iſles*, South half Eaſt	25
From *Scilly* to *Uſhant*, S E by S.	35
From the *Lizard* to *Uſhant*, South	27
From *Hartland Point* to the Iſland of *Londey*, North	03
From *Londey* to the *Holms*, Eaſt by North	18
From *Black Rock* to *Tuſcar*, Eaſt North Eaſt	03
From *Cape Clear* to *Old-head*, Eaſt by North	13
From *Greſholm* to *Waterford*, Weſt by North	21
From the *Land's end* of *England* to *Tuſcar*, North by Weſt	40
From the *Land's end* of *England* to *Waterford*, North North Weſt	40
From *Holy-hill* in the Iſland of *Angleſey*, to the Bar of *Doublin*, W by N	18½
From *Rockel* to *Black Rock* South by Eaſt	80
From the *Land's end* of *England* to *Cape Clear* North Weſt by Weſt	53
From the *Land's end* of *England* to *Old-head*, North Weſt	45

A Table of the Soundings coming into the Channel, *repſecting the Bearing and Diſtances of* Silly, Uſhant, *the* Lizard, &c. *with the Depth in Fathoms and the Various Sorts of Ground.*

	Bearings	Diſt.	Latit.		Depth	*The various Sorts of Ground*
			D.	M		
Silly	South	05	50	20	50	Branny ſand, like ground Wheat
	SS E	05	50	12	45	White ſand mixed with ſhells
	SS E	06			50	Coarſe Owſe
	ES E	06			53	Coarſe ſand and fine red ſhells
	E by S	08	50	12	78	Owſe ſand, with Queen ſhells amongſt it
	E by N	07	49	15	72	Owſe like Muſtard ſeed, with broken ſhells
	E by N	15	48	50	72	Pepper ſand, black and yellow
	E by N	24	49	50	72	Black, white and red ſtones with owſe
	E N E	07	49	15	60	Some black ſand
	E N E	20	49	15	80	Rocky Ground
	E N E	55			103	Fine white ſand
	N E by E	22	49	10	85	Sand and owſe together
	NE by E	10	49	20	55	White and red ſand mixed with ſhells
	N E by E	50	49	50	100	White ſand with Owſe and Nits
	N E by E	25	49	50	64	Branny ſand, with white and red ſhells
	N E by E	06	49	10	48	Black ſand
	N E by E	13	49	43	65	Branny ſand with ſome pieces of ſhells

	Bearings	Diſt	Latit. D	Latit. M.	Dep	*The various ſorts of Ground*
Silly	North Eaſt	10	49	40	65	Branny ſand, ſmall ſtones, Herring Bones
	N E by N	10	49	20	57	Small red ſand
	N N E	102	49	47	100	White ſand then entring on the Bank
	N by	18			68	Red ſand with black & white *Scollop ſhells*
	North	12	49	15	65	Broken ſhells with white and red ſand
	North	10	49	47	65	White ſand on the Eaſt part of the Bank
	N N W	33	48	52	77	Red ſand and ſhells amongſt it
	N W by N	07	49	40	54	More ſhells, the *Lizard* NE diſt. 18 leag
	North Weſt	04	50	10	50	Branny ſand, with black & broken ſhells
	North Weſt	07	49	47	60	Stony Ground
	N W by N	04	50	25	61	Red & black ſand, with gliſtering ſhells
	N W by W	2½			44	Shells & ſand like the points of Needles
	W by N	13	50	25	63	Fine white ſand, with a little owſe
	Weſt	21	50	08	66	Red & black ſand, with gliſtering ſhells
	W by S	32	49	50	75	Fine white ſand, and gliſtering ſhells
	W by S	3½			40	Like broken Wheat or Coarſe Bran

	Bearings	Diſt	Latit. D	Latit. M.	Dep	*The various ſorts of Ground*
Uſhant	North	06	48	36	63	Full of ſmall Mace ſand
	N by E	18	48	15	80	Round ſtones mixed with Scollop ſhells
	N E by N	11			60	Small beaton ſhells and Hakes Teeth
	North Eaſt	29	48	50	85	Great and ſmall pieces of Cockel ſhells
	North Eaſt	25	48	10	55	Gray and brown ſand with white ſhells
	N E by E	07	48	30	68	White and gray mace ſand
	E N E	14	48	36	68	Small ſhells and Herring bones
	E by N	25	48	30	85	White and gray ſand with ſmall red ſtones
	Eaſt	18	49	00	70	Branny ſand, with ſome ſhells
	Eaſt	06	48	00	65	Red ſand, ſhells, things like Needl points
	Eaſt	15	49	15	70	Fine white ſand
	Eaſt	33	49	15	87	Dazling ſand like Barley ſtraw
	Eaſt	04	49	10	60	Full of Mace ſand and broken ſhells
	E by S	04	48	56	53	Shells like Perriwincles
	E S E	15	49	15	70	Shells gray and red pieces of Cockle ſhells
	E S E	12	49	20	68	Groſs white ſand with ſhells
	E S E	08	49	05	64	White ſhells and fine ſmall ſtones
	E S E	06			60	Hakes Teeth & ſhells like Oatmeal Husks
	S E by E	20	49	15	72	Great ſtones like Beans and Peaſe
	S E by E	09	49	15	65	Sand and ſome ſhells
	S E by E	37	48	30	65	James's ſhells
	S E by E	15	49	25	60	Small Scollop ſhellt with ſome ſtones

North

	Bearings	Diſt	Dep.	*The various ſorts of Grunds.*
Lizard	North Eaſt	$6\frac{1}{2}$	43	Marſhy-ſhells and ſome Scollop ſhells
	N E by N.	00	52	Marſhy-ſhells and Hakes Teeth
	N N E	09	50	Marſhy-ſhells like Oatmeal Husks
	N by E	15	58	Marſhy-ſhells and Hakes Teeth
	North	01	39	Stones as big as Beans, ſo four Leagues off
	North Weſt	05	45	Gray ſand like Oatmeal Flower
	North Weſt	03	46	Marſhy-ſhells and ſmall ſtones
	W N W	$3\frac{1}{2}$	47	Small ſhingly ſtones, and Marſhy ſhells
	W by N	04	40	Fine Marſhy ſhelly and white ſtones
	W by S	30	41	Black gravelly Ground with ſmall ſtones
	N E by E	12	57	Scollop ſhells
	N E by E	04	44	Great ſtones and rough Ground
	North Eaſt	$6\frac{1}{0}$	50	Like Husks of Oatmeal and ſmall ſtones
Eddyſtone	N ½ Mile		35	Dirty brown ſand and Hakes Teeth
	W 2 Miles		34	Dirty brown ſand
	S 1 Mile		26	Fine ſand, and within this 28 and 30 Fathom
Start	N by E Nly	$8\frac{1}{2}$	40	Like the Duſt of a Grindſtone, with Hakes Teeth and ſhells
	N W by W	$4\frac{1}{2}$	43	
	N W by N	03	38	Gravelly ſand, ſmall ſtones and ſhells
	N by W. wly	12	38	Reddiſh ſhells maſhed, as if beat in a Morter, white ſand and Scollop ſhells
	N W by W	14	42	
Forelan	N E by E	08	35	Small ſhingly ſtones, as big as Peaſe
	North	08	40	Streamy Ground with ſmall ſtones
	N by E	$5\frac{1}{2}$	33	The ſame with ſome black ſands
	N E by N	11	41	Fine Sand and Scollop ſhells
	N N E	08	40	Fine Sand, Scollop ſhells and ſmall ſtones
	N E by E	$2\frac{1}{2}$	27	Shingly Ground
	W N W	$2\frac{1}{2}$	20	Small ſtones
Needles	N E by E	02	17	Great Shingly Ground
	N E ½ E	$2\frac{1}{2}$	19	Small Shingly Ground
	North Eaſt	02	13	Rocky Ground
I. Wight	N by W	$3\frac{1}{2}$	20	All the Ground from *Albions* to the Eaſt end of the *Wight* is Chalky, and brown ſand.
	E by N	04	21	
	N by E	03	18	
Dunnoſe	W by S	04	16	Rough Ground with ſome big ſtones
	Weſt	04	21	A kind of ſandy fiſhy Ground
	W N W	08	33	Fiſhing Ground ſomewhat red, with ſtones as big as Peaſe, and ſmall as Beans.
	N by W	06	26	

Directions

Directions to ſail into ſome of the Principal Harbours on the Coaſt of *England*.

Directions to ſail into Silly.

SILLY is divided into divers Iſlands; along the Weſt ſide lieth a great many Rocks. There are ſeveral Channels through which to go in, but the Southermoſt, called St. *Mary*'s Sound is the beſt, being a fair opening of the Channel, but near the midſt lie two ſunken Rocks, which in foul Weather, the Sea may be ſeen to break over: It is beſt to leave them on the Larboard ſide going in, and on the Starboard ſide coming out: Go ſo near the Starboard ſhore, as that a Stone might be almoſt thrown on ſhore, and when you are within the Point, luff up round, and come to an Anchor in Sight of the Houſes; or when the Town is brought open to the Valley, leave two Thirds of the Harbour on the Lorboard-ſide.

To ſail into Foy.

To ſail into *Foy*, it is neceſſary to have at leaſt Half-flood; run in amidſt the Channel between the two Points; and being come within, chuſe either ſide, but the moſt Water is by the Weſt-Land, between the *Stakes* and the ſquare Steeple. Being come within the *Stakes*, as you come in by Land, bear ſomewhat off preſently from the Weſt ſhore, almoſt in the midſt of the Channel neareſt the Weſt ſhore, until you come before the Village that lieth on the Weſt ſide; where is a deep Dock, in which Ships that draw 16 Foot, may lie a-float at low-water; four Ships may lie in the ſaid Dock.

To ſail into Falmouth.

Upon the Weſt Point of the Haven of *Falmouth*, ſtandeth a Caſtle on the high Land called *Pendennis* Caſtle. In the Entry neareſt the ſaid Weſt ſide lieth a great Rock above Water, you may ſail in at either ſide of it, at the inner ſide of the Eaſt point lie alſo ſome Rocks off the ſhore; on the Eaſt ſide is deepeſt Water and moſt Room, therefore in going in, give the Eaſt Point a large Birth; there will be 7 or 8 fathom. Keep the ſaid ſhore till you come within St. *Maude*'s Caſtle; which when it bears Eaſt there will be 16 or 17 fathom; but half the Harbour over towards *Smithick*, is but 4 or 5 Fathom; obſerve in going in to keep the *Manacles* open and ſhut on the Point of *Falmouth Caſtle*; and ſo it muſt be kept till you ſhut the Church over *Penny Comquick*, into the North Eaſt end of the *Smithick*, and ſo bear over to St. *Maudes* and ride with the Caſtle Eaſt, laying one Anchor in 18 Fathom, and the Weſtermoſt Anchor in 4 Fathom, as ſhall ſeem convenient.

To ſail into Plymouth.

At the Eaſtermoſt Point of *Plymouth Sound* lieth an high round Rock called *Mewſtone*; between it and the *Rambead* lieth the ſaid *Sound*. North North Eaſt being round and deep.

A

A little to the Northward of *Ramhead*, is a fair *Sand Bay*, where is good Anchoring cloſe under the Land, in 9 or 10 fathom. South a little Eaſterly from *Ramhead*, lies a Rock above Water called the *Eddyſtone*, the Point of *Plymouth* lieth from it N by E. diſtant about 4 Leagues.

In the *Sound*, by the Land of *Plymouth*, lieth an Iſland called St. *Nicholas*, or *Drake Iſland*, which is joined to the Weſt ſide, with a Range of Rocks under Water, ſo that you may ſail along to the Eaſtward of it.

To ſail into Catwater.

To ſail into *Catwater*, run in between the Iſland and the Point on the Eaſt ſide with the Land of *Plymouth*, till *Catwater* open on the Starboard ſide, then go into the Eaſtward between the Point of *Plymouth*, and the Point on the Starboard-ſide, leaving moſt Part of the Channel on the Starboard ſide, until you come within the Point, and Anchor there right againſt the high ſteep Northern Land; there is at low Water, with extraordinary Tides 4 and 5 fathom.

In ſailing into *Catwater*, beſure to give a good Birth to the Southern Point of the Entry, for there lies off the ſaid Point a Ledge of Rocks under Water, about two Cables Length off from the Land. Upon the Point of the Ledge lies a Buoy, where is about 12 foot Water at half flood, which Buoy muſt be leſt on the *Starboard-ſide* going in, and when *Catwater* is altogether open you may run into the Eaſtward, leaving in the Entry of the Harbour two thirds of the Channel on the Starboard ſide, as aforeſaid, becauſe the South ſhore is ſomewhat flat off, there lying a ſandy Bank, which reaceth to the ſecond Point of the South ſhore of *Catwater*.

A little to the Eaſtward of *Drake Iſland*, lies a Rock under Water, upon which at Low-water, it is not deeper than two fathom. To ſail within the Land you may go to the Eaſtward or Weſtward of the Rock, as occaſion ſerves.

To ſail into Dartmouth.

Dartmouth hath a narrow Entry lying in between two high Lands: On each ſide of the Haven, ſtandeth a little Caſtle; on the Weſt ſide is a Church on the high Land, called St. *Patrick*'s Church. To ſail in coming from the Weſtward, run in along by the Weſt land, ſo far to the Eaſtward until the Key of the Village (on the Eaſt ſide of the Haven) be brought in the midſt of the Entry of the Haven between the two Lands; it is convenient to have a Boat ready (if any Guſt of Wind ſhould come from the high Land) to row in. Being come in, edge over to the Weſt ſide before the Brewhouſe, and anchor there in 10 or 11 Fath. or before the Village, on the Eaſt ſide at pleaſure. At the Eaſt ſide lieth a ſunken Rock; to avoid which, ſteer in with St *Patrick*'s Church, and do not bring the Village, which ſtandeth on the Weſt ſide of the Harbour, without the ſaid Church, but keep the outer Houſe of the ſaid Village in the Eaſt ſide of the Chappel always in ſight, without the Bulwarks on the North ſide by St. *Patrick*'s Church; then there is no danger of the Rock, in the Range by the North-point. Between *Dartmouth* and the *Start*, neareſt to *Dartmouth*, ſtandeth a white ſquare Steeple, called *Jackman*, which is a very good Mark to know *Dartmouth* by.

To ſail into Torbay.

Bring the Weſt point of the *Berry* S by E. or S S E. from you; and anchor there in 7 or 8 Fathom, where you ſhall be Landlockt, for a S. and S W. Wind. At the North Eaſt end of the Bay is alſo a Tide-Haven called the *Tormain*; before it is a very good AnchorGround in 4 or 5 Fathom, according as you deſire to be nearer or farther from the ſhore.

Directions for Sailing in at the Eaſt End of the Iſle *of* Wight *to* Portſmouth-Harbour *and alſo to* Hampton.

If you come from the Eaſtward with a Northerly Wind, bound into the *Iſle of Wight*, or *Portſmouth*; after you are come to the Weſtwards of the ſhoal called the *Owers*, hale in North Weſt with St. *Hellens* Point; but do not hale too much to the Northwards, for there lies a Bank off of *Longſtone* Haven, to the Eaſtward of the *Horſe*, that hath not above 13 Foot on it at low Water; but keeping in 7 or 8 Fathom carrieth you clear without it, and will bring you to the S. E. end of the Sand called the *Horſe*. St. *Hellen* Church being S W by W. from you, you may run in 5 Fathom, and when you have brought the Weſtermoſt great white Parch, or Chalk upon *Parch Down* (which is the high Land to the Northwards of *Portſmouth* a Ship's length to the Weſtward of *South Sea* Caſtle that ſtands upon the Beach, then you may luff up without fear: Being then to the Weſtward of the *Horſe*, and ſteering with that Mark, it will lead you in a long the *Horſe* unto the Beach, and ſo into the Harbour of *Portſmouth*, keeping along cloſe by the ſhore, until you come to the Town-walls-end, and there you muſt bear off a little for a *Flat*, that lieth off from the ſhore; this is for an Eaſterly Wind. But if you intend for *Stokes bay* when you have brought the Fire-Beacon on *Brown Down*, which is to the W. N. W. of *Haſlewood*-point within a Ship's length without the ſaid Point, then you may bear to the Weſtwards along the out ſide of the *Spithead*, which is the ſhoal on the Weſt ſide of the Entrance of *Portſmouth* Haven.

If the Wind be Weſterly or Southerly, and you are coming from the Weſtward and deſign, for St. *Hellens* Road or *Stokes-bay*; from *Dunnoſe* to St. *Hellens* point, the Courſe is NE by N. and NNE. but borrow no nearer to St. *Hellens* than 6 or 7 Fathom, for the *Spit* lies off a great way, but if it be clear Weather, that you may keep *Sand Down* Caſtle open of the *Culver Cliff*, that Mark will lead you without the *Spit* of the Point; ſteering along in this Mark, until you open St *Hellens*-Church about two Ships length open of the *Red Cliff* within St. *Hellens*-point or *Port Sea* Caſtle to the Eaſtward of *South Sea* Caſtle, then are you clear of the Point, and may ſteer to St. *Hellens* Road N. W. and having brought the Point S. by W. or between that and the S by E. you may anchor in 7 or 8 Fathom Water on very good Ground.

Note, That you have no good clear Ground all along the Iſland until you have opened St. *Hellens* Church, as aforeſaid, and have brought the Point to bear from you S S W.

From St. *Hellens* point, to go between *Noman's-Land,* and the *Horſe,* the direct Courſe in, is NW. by N. and NW. but you have no ſhoaling upon the SW ſide of *Noman's-Land,* for you have 16 fathom, and the next Caſt but 3; but at the *Horſe* you may ſtand in 10, 9, or 8 Fathom: If the ſtrong Tide be ſpent, and ſmooth Water, you ſhall have a great waſhing of them by the Overfall of the Water; but eſpecially on *Noman's Land,* if it be clear Weather. There are very good Marks to lead you in, which are as follow; keep the two Windmills on the *Downs* on the *Iſle of Wight,* that they may be ſeen clear all over the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and ſo up all along the Iſland without ſome middle Ground that lieth W.S.W. off the Point of *Noman's-Land.*

Alſo from St. *Hellens*-point (if it be clear Weather that you can ſee it) there is a direct Mark, *viz.* a Part of an old Caſtle formerly called *Haſlewood* Caſtle, ſtanding on *Gilkeker* Point (which is kept white;) keep *Goſport Church* and that Caſtle in one, or this Caſtle in the middle of the Wood about the Church, which ſheweth with a Valley like a Saddle, and ſo you may run directly in without Fear. Or if the Wind be ſo that you are forced to turn in, then you may run the ſaid Mark within two ſails breadth of each end of the Wood. In the middle of the Channel is 18 fathom Water; and if you bring the ſaid Mark right under the North end of the Wood you ſhall run in a middle Ground near the *Horſe,* that hath not above 10 Foot on it at Low-water, and hard ſand.

To ſail within the Wight *in thick Weather.*

To ſail between the *Main* and the *Wight* in thick Weather, borrow in 6 Fathom off St. *Hellens,* and ſteer N W. by N. and NNW. from St. *Hellens*-point, till you have 12 Fathom, and then ſteer more Weſterly, as you find the Depth; come no nearer *Noman's Land* than 9 or 10 fathom; in that Depth you may keep along the *Wight* Side, if the Wind be Southerly, but if it be large, keep in 14 or 15 Fathom, which is a good Birth from both ſides, and ſo ſteer W by S. and W.S.W. as you find the Depth until you come to *Cows.* *Note,* That being about *Stoaks*-bay, there will be leſs Water, if you go nearer to *Cows,* there you may anchor in 12 or 14 Fathom in the midſt of the Channel, where is good owſy Ground.

Directions for Dover-*Road.*

The beſt Ground in *Dover-Road* is with the *White-way,* to the NW. of *Dover-Caſtle,* or between that Hill that comes from St. *James's* Church, which is a flat Steeple at the North end of *Dover* Town, for a thwart Mark, and ſo in what Depth you pleaſe, from 12 to 14 Fathom. Thwart of *Foulkſtone* in 12 or 14 fathom is very good Ground.

Directions to ſail into the North-Foreland *through the* Gulls *in the Night.*

If your Ground Tackle ſhould fall in the Night, riding at the *North Foreland*, as very often has happened, and you cannot weather the *Foreland*, weather the *Northſand-head*; if you can but ſee the *North Foreland* Light, when that Light-houſe bears NW. or N W by N. then bear over into 8 or 9 Fathom, and being in that Depth (ſteering S.S W.) you may be ſure it will carry you directly through with the *Brake*, but keeping your Lead carefully, and borrowing no nearer the *Brake* than 5 Fathom, nor going without 9 Fathom, or 9 and a half, as you have the Tide under you; this Courſe will lead you through without Danger.

Directions for the North end of the Goodwin, *for ſuch as ſail from the* North-Foreland *to the Southward in the Night.*

If you be at the *North-Foreland*, bound for the *Downs*, and that the Tides do fall out too early or too late, to turn into the *Downs* with the Wind at SW. or SSW. take the following Directions.

If it be in the Morning before Day, then be ſure to weigh Anchor in convenient time, to be at the *North-ſand-head* at the turning of the Tide, to the ſouthward. From the *Foreland* you may ſteer out with a Flood Tide, S E. by E. and S E. or keep the Light of the *North Foreland*, NW by N. this Courſe will lead you out. But for the more certainty, be ſure keep the Lead well, and then you may borrow off and on with the aforeſaid Winds, in 7 or 8 Fathom; and ſteering out with the aforeſaid Courſe, you ſhall find the Depth ſuddenly change to 15 or 20 fathom; then you may hale up cloſe to the ſouthward, along the Back of the *Goodwin*, the Eaſtermoſt ſide of which lies S.S.W. and N.N.E. 12 or 14 fathom; and is not above a Saker ſhot from the Sand. But if it be in the Day time, and the Wind blows ſo hard that you cannot well tack to run through the *Gulls*, then the Marks to carry you out at the *North-ſand-head*, is the flat Church upon the *Foreland* called St. *Peters*, a Ship's Length to the Northwards of *Broad-ſtairs* Peer-head; or borrow upon the Sand by the Lead as aforeſaid, and ſo taking the firſt of the Tide without the Sand, you may ſtand to the South Eaſtwards, till the *South Foreland* bears W. by S then caſt about, and you ſhall weather the *South-ſand-head*, and be in the *Downs*-Road as ſoon as any other Ship that parted with you at the *Foreland*.

Directions for ſailing over the Spits, *the* Wallet, *and by the* Naze *into* Harwich

Sailing down the *Swin* or *Kings-Channel*, and that you would ſail into *Harwich* over the Buoy of the *Spits* into the *Wallet*, you muſt obſerve your Tides, for at the *Spits* of the Buoy lieth in 5, 6, or 7 foot Water at Low-Water; and the Paſſage often alters, ſometimes more Water ſometimes leſs. The Buoy lieth on the Weſt end of the *Gunfleet* Sand, and the Eaſt end of the *Buxey*, bearing from a flat Steeple, called *Great Holland Church*, South and by Eaſt. Being over the *Spits*, you come into the *Wallet*, where is very good Anchoring in five, ſix, ſeven, and eight fathom Water; the Sands lying without, makes it a moſt excellent Road. There is a good and deep

Channel to ſail in at the *Wallet*, between the *Gunfleet* and the *Weſt* Rocks, but 'tis ſeldom uſed. Being over the *Spits*, in the *Wallet*, ſteer away for the *Naze*, which may be known by the Trees, and a Houſe that ſtandeth on it, keep about half a Mile, or a Mile off from the *Naze*, to avoid the ſtone Bank which hath but 5 foot Water on it at low-Water; and lieth from the *Naze* Trees E by N. About a Mile and a half from the *Naze* Point, there is but 8 or 9 Foot Water between it and the *Naze* at low Water; keep *Payn*'s Trees which lie a little to the Southward of *Harwich*, open and ſhut with *Harwich Cliff*, and this Mark will carry you on the ſtone Banks, and the Trees on the *Corkland*, juſt open of the *Nazeland*, will carry you on the Bank alſo. There is a good leading Mark to carry you between the *Naze*, and the ſtone Bank, which is *Harwich* Steeple, on *Harwich* Beacon Cliff; and will alſo carry you between the *Pyeſand*, and the Ridge in the *Rowling Ground*, where Ships anchor in 3 and 4 fathom at low Water. The Mark to Anchor in the beſt of the *Rowling Ground*, is to bring *Harwich Windmill* 2 Sails breadth open of *Harwich-Cliff*: And to ſail from the *Rowling Ground* to the *Naze*, keep *Payn's* Trees open of *Harwich-Cliff*, till you bring the *Naze* to bear SW. then keep *Harwich* ſteeple on the Beacon *Cliff*, to run within the ſtone Bank. There is a Channel to ſail from the *Naze* between the Cork ſand and the Ridge, keeping the *Naze* Trees SW. ſailing down NE. between the Cork and the Ridge, in 5, 6, and 7 fathom Water. And when you have brought *Harwich* ſteeple with the Brewhouſe that lieth to the N. ward of *Languard Fort*, then are you clear of the Cork Ledge; this Channel is much uſed by the Light *Colliers* going to the Northwards.

Being in the *Rowling Grounds*, and that you would ſail into *Harwich* Harbour, keep cloſe by the *Andrews*, which is a Sand that lieth off from *Languard* Fort, and is ſteep too on the Weſt ſide; The Tide of Ebb runneth ſtrong over the *Andrews* the firſt half Ebb, of which you muſt have a care. This Sand is dry at low Water; keep cloſe by the Beach of *Languard* Fort, to avoid the *Alter*, which is a ſmall ſtony ſhelf that lieth right Weſt from *Languard* Fort, about a Cable and a half's Length from the Beach at the Fort, on which is but 5 and 6 Foot at low Water. You may ſail to the Weſtward of it, between it and *Harwich Cliff*, according as the Tide is up, and what Draught of Water your Ship draweth: But if you ſhould want to go into *Harwich* at low Water, and your Ship draw above 15 foot, you muſt ſtay for the Flood to have Water over the *Glutton*, which is a narrow Ridge, and ſtretcheth off from the Beach thwart the Channel, a little within the Brew-houſe, that is to the Northward of *Languard Fort*: Being paſt the *Glutton*, you muſt keep cloſe to the *Beach*, to avoid the Griſtle that lieth in the middle between *Harwich* and the *Beach* of *Languard* Fort, on which is but three foot at low Water, there is a ſmall Channel between the Griſtle and the Guard, of 9 foot at low Water; but when you have opened *Dover* Court Church of *Harwich* Town, then are you clear of the Griſtle and the Guard, and may Anchor before the Town of *Harwich*, in 5 fathom Water, to run into *Ipſwich* Water, and Anchor; this is a very ſafe Harbour, and if a Ship ſhould chance to blow a ſhore ſhe cannot take harm, the ſhores being ſoft owſe. The Spring-Tides riſe 15 and 16 foot, and the Neap-Tides 10 and 11 Foot.

Directions to ſail into Harwich *through the* Sled-way.

Being at the Buoy of the *Spits*, and that you will not ſail over the *Spits*, then keep down by the *Gunfleet-ſand*, in 7 or 8 fathom Water till you come within two Miles of the Buoy of the *Gunfleet*, and then come no nearer than 9 fathom Water, for there lieth off a *Spit*, E S E. from the and about a Cable's length; to the Eaſtward of this *Spit* is a ſmall Swatch through the Sand, into which, and *Goldmores Gut*, the Tide of Flood ſetteth ſtrong into the *Wallet*, of which you muſt have a Care when you come near it, eſpecially in little Winds or Calms, you may be haled on the *Gunfleet-ſand*; this Sand lieth NE and SW. and drieth in ſeveral Places: The Buoy of the *Gunfleet* beareth from the *Naze* S E by E. Eaſterly; you may ſtand into 7 or 8 fathom along the Side of the W. Rock into the *Sledway*, keeping *Balſey Church*, N by W. and N N W. till you bring *Harwich* ſteeple on the Brewhouſe, (that lieth to the Northward of *Languard Foot*) which will carry you clear of the Cork Ledge, on which is two Fathom and a half at low Water, and then ſtand to the Weſtward, and keep *Orford* Church and Caſtle open of *Balſey Church* a Sails Breadth, till you have the Lights together, keeping them ſo till you are paſt the *Andrews*, and then follow the former Directions for ſailing into *Harwich*: You muſt ſtand in upon the *Platters* into 5 fathom, on which ſand is but 2 or 3 foot at low Water; the Ridge hath 7 foot at low Water; a great Part of the Cork-ſand drieth at low Water; and lieth in length NE. and SW. about two Miles and a half long, and a Mile Broad; Weſt Rocks lie in Length NE. and S Weſt about 3 Miles, and 2 Miles broad, and drieth in ſeveral Places, full of Banks and Swatches, the Ground rocky and ſtony in many Places, there is a ſmall narrow Channel between the Weſt Rocks and the Cork.

For the more particular Directions for ſailing into theſe and other Harbours in *England*, *Scotland*, *Holland Normandy*, *Britaigne*, &c. ſee the laſt Edition of the Coaſting Pilot, newly Corrected and Reprinted for Mr. *Page* and *Mount*, on *Great-Tower-Hill*, LONDON. With many Additions.

FINIS

4 FEB 57